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THE MAGAZINE FOR INFORMATION EXECUTIVES

SPECIAL ISSUE

Making The Network Pay Off

AN INTERNATIONAL DATA GROUP PUBLICATION

American President Companies' James Marston

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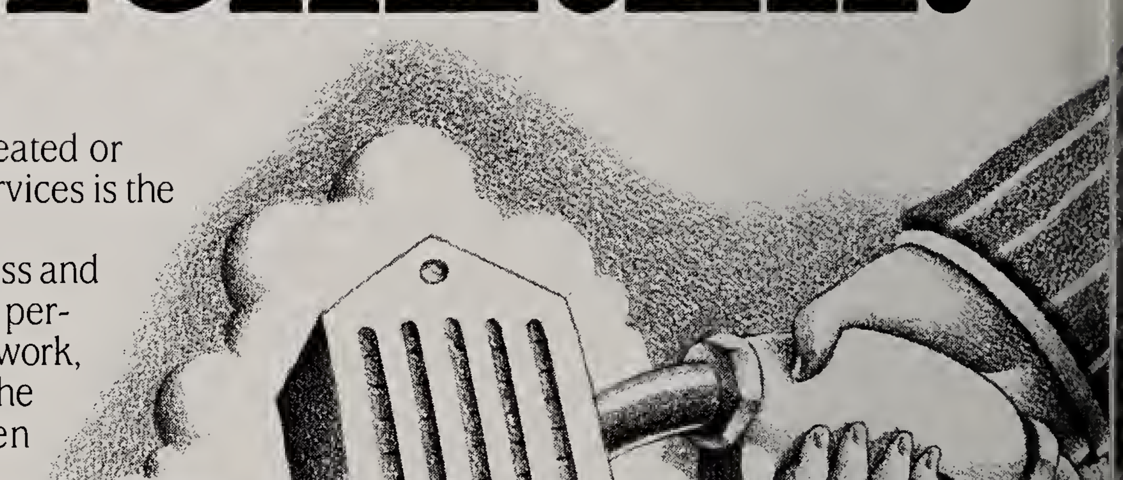

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CIO

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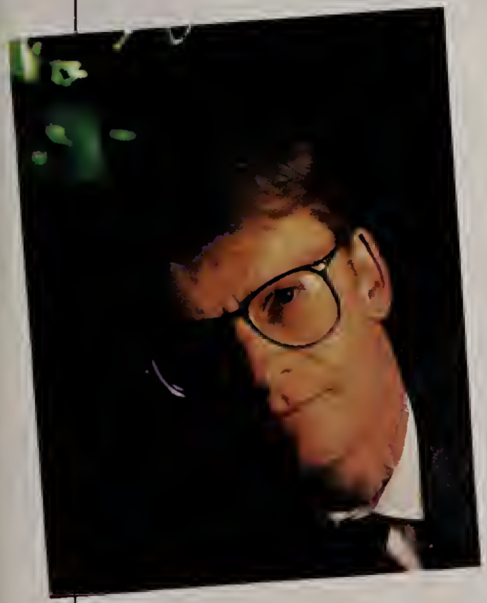

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LETTER FROM THE EDITOR

When we polled readers of *CIO* by mail about the technologies they were most interested in reading about, the overwhelming response was communications. Most responses were brief and vague—"communications" or "networks"—which was not a whole lot to go on. However, seeing our readers' hunger for information on this subject, we decided to create an issue entirely devoted to communications.

Where to start? First we had to deduce what communications meant to our readers. To do this our editorial team made a lot of calls. We checked out the communications issues that are important to our advisory board members, to information executives we've interviewed or met at conferences and to telecommunications executives. We soon learned that there was a horrendous amount of confusion out there surrounding communications.

PHOTO BY RUSSELL WINDMAN

The purpose of this special issue is to put communications strategies in perspective for the CIO; strategies for evaluating the choices available for implementing networks, for sifting through vendor claims, for creating new applications that take advantage of the latest communications technologies and for managing the complexity of the emerging networked organization, among others.

An integral part of this month's issue is an extensive teleconference whose participants included a roster of IS and telecom executives, networking gurus and representatives of leading vendors. Our goal was to elucidate major topics of concern for the IT community. Highlights of the teleconference, moderated by Peter G.W. Keen, executive director of the International Center for Information Technologies, begin on Page 22. We explored a slew of ideas and perspectives, including how telecommunications has made a difference to companies and the concepts of cooperative processing and network management. Our participants enjoyed a candid give and take, and the thoughtfulness of the ideas that emerged was impressive.

Preparing this issue required a massive amount of teamwork among our editorial staff. Yet special thanks are due to a few of our group for spearheading critical parts of the project. Senior Editor Allan E. Alter did an outstanding job in formulating many of the article ideas and the structure for this issue. Associate Editor Abbie Lundberg performed a Herculean task in meticulously editing the teleconference and many of the articles. We pressed Art Director Mary Marshall to design "just a little different look" for the issue. As usual, she came through for us, never even slamming the door of her office when she saw the editors approaching with seemingly endless requests. Editorial Assistant Megan Santosus did a fine job in putting the technical aspects of the teleconference together.

We consider this issue an opening move toward surmounting the confusion that surrounds the management of communications resources. Let us know what you think. One executive said that "the CIO needs to feel it's OK to be confused." Still, we hope the confusion does not endure for too long.

Marcia Blumenthal

CIO

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Parlez Vous '92?

CIOs who don't start boning up on their Eurosystems risk weakening their companies' competitive capability

BY CHARLES FITTS

At midnight on December 31, 1992, the economic structure of the European Community (EC) will change. A huge new market of 320 million people, with a gross domestic product (GDP) larger than that of the United States and Canada combined, will suddenly come into being. That's midnight in Greenwich, England, so it will be only 7 p.m. in New York. Most American CIOs will just be heading out to their favorite New Year's Eve parties.

Hopefully they will be able to relax and enjoy themselves—secure in the knowledge that they have already revised their information strategies to meet this new competitive environment. But changes in the European business structure will be both broad and deep. CIOs will have to start NOW if they want their systems to be effective when those changes take place.

The driving force behind EC '92 is the Single European Act adopted by the European Council in 1987. The Act establishes an internal European market in which goods, people, services and capital may move freely among member countries (West Germany, France, Italy, the United Kingdom, Spain, the Netherlands, Belgium, Greece, Denmark, Ireland, Portugal and Luxembourg). The idea of a "United States of Europe" is not far off the mark. Goods and services will flow between EC countries just as freely as they flow between Alabama and Ohio.

By the 1992 deadline, most physical, technical and financial barriers to free trade will have been removed. Other initiatives, such as adoption of a common currency, will take longer to accomplish. But a unified Europe with a single central bank and harmonized monetary and tax structures is in the offing.

Companies doing business with EC countries after 1992 will be confronted with new market structures and consumer buying patterns—and therefore, new problems. But there will be new opportunities as well. Products will have to satisfy only a single EC standard instead of conforming to many conflicting national codes. Tariffs, duties and border delays will be eliminated. Administrative red tape and nonproductive overhead costs associated with the above will be reduced.

These changes will have a major impact on the organizational structure and the marketing and distribution strategies of any company doing business in the EC. CIOs

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CIO

May 1990

"The real impact of the microprocessor revolution will not come from the individual use of personal computers but from the accelerating replacement of traditional mainframes and minicomputers with much lower-cost microprocessor-based alternatives."

Patrick J. McGovern, Chairman
International Data Group

Dear Executive:

The information revolution is continuing to accelerate. Applications that once could be performed only by a mainframe can now be done at your desk. Networks are proliferating. Customers are more often connecting computers to exchange information, rather than simply using individual machines. Such distributed processing potentially offers lower costs and greater productivity.

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As part of our ongoing education program CIO Magazine and AMR International are teaming up to present our third CIO EXECUTIVE FORUM to help you explore the real business issues for the '90s. For detailed information on "Linking Information Resources & Business Strategies," to be held June 13-15 in Washington, D.C., please call Lori Cardarelli (508) 935-4631 or Diane Martin (508) 935-4274. They'll rush you complete information via return mail.

I hope you will enjoy reading the May issue of CIO Magazine and every issue to come.

Sincerely,

Joseph L. Levy
President and Publisher

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Coming in CIO

Do You Believe in CFOs?

And do they believe in you? Well don't panic yet, but it just may be that at least some are out to conquer the CIO's universe.

The Quest for Quality

Many companies today are concerned with the issue of quality. But what part does IT play in this pursuit? *CIO* takes a look.

Outsourcing

Although we stop short of calling it all the rage, letting third parties take on the burden (and worry) of a variety of information-processing chores is clearly an idea that is spreading. Is outsourcing a blessing or merely a contagion?

Update on ISDN

What's new on the integrated services digital network since we last examined it a year ago? Has ISDN fulfilled its many promises? *CIO* takes a second look.

will have to develop new systems portfolios to support these new strategic directions. This will require a total rethinking of how IT can be used for competitive advantage in the new environment.

The new Europe will be different in many tangible and significant ways. European companies have long been burdened with overhead costs not borne by other countries. For instance, there are many costs associated with border control and delays. Also, companies selling throughout the EC have had to develop their products in conformance with 12 different sets of standards. This will no longer be the case. As a result of eliminating much of this nonproductive overhead, EC price levels could decrease by as much as 8.3 percent. This will give EC-based firms a favorable competitive position in world markets.

The GDP is expected to grow accordingly. Growth is also expected to show up in EC employment figures. Some sources estimate that 1.8 million jobs will be added by the end of 1997. Not a bad economic outlook—close to full employment while experiencing major economic expansion and falling consumer prices. While conventional wisdom has it that these three conditions cannot occur simultaneously, it appears that at least for a few years, EC countries will be able to have their cake and eat it too.

The European Free Trade Association (EFTA) is another European economic unit that should be considered in developing an effective European systems structure. While EFTA—which comprises Austria, Finland, Sweden, Norway, Iceland and Switzerland—does not have open borders (either within itself or with the EC) or open access to the EC economy, it seeks to achieve bargaining power through unity. EFTA companies are seeking affiliation with the EC in order to gain more open access to European markets. As this article was being written, Sweden-based Volvo announced a major cooperation with Renault of France. Other similar connections between the EC and EFTA are to be expected as 1992 approaches.

> *European companies generally treat their IT people as an integral part of the overall business team. Consequently, European professionals tend to have a broader understanding of underlying business issues and objectives.*

Taken together, the EC and EFTA blocs form a sizable economic force. If the newly democratized *glasnost* countries such as East Germany, Poland and Czechoslovakia are also considered, an even larger European market comes into focus.

Corporate CIOs who have had to wade through the red tape, poor international coordination and high costs of Europe's Post, Telephone and Telegraph (PTT) bureaus will be looking forward to 1992. European telecommunications systems suffer from poor maintenance and low reliability. Lead times for any PTT-provided services are extreme, especially when transborder lines are involved. Lead time for an international circuit in Europe runs between four and eight months, compared to six weeks in the United States.

Moreover, diverse equipment standards and irrational tariff structures make it very difficult to install a sophisticated teleprocessing system on a pan-European basis. Generally, costs for transborder leased lines are about twice the cost for single-country lines. (Of course, there is always the inexplicable exception: In France, it's just the other way around.)

But CIOs will find a transformed and modern IT infrastructure awaiting them after 1992. The telecommunications industry is moving rapidly from a position of fragmentation, protectionism and monopoly to unification, free-market entry and first-mover advantage.

The EC is matching these lofty goals with major investments aimed at modernizing European telecommunications products and services. The monopolies previously enjoyed by the state-controlled PTTs will be abolished. Their thinly-veiled barriers against outside competition will be replaced by a uniform standards and testing policy. PTT procurements will no longer be dominated by the nationally protected telecommunications giants such as Alcatel and Siemens. European PTTs have developed 10 separate switching systems at a cost of $10 billion. These wasteful practices will be eliminated. The result will be an efficient telecommunications industry capable of meeting the most advanced teleprocessing system specifications.

Acronyms abound in this race for technical excellence. ESPRIT, RACE, STAR and APOLLO are massive R&D projects aimed at reaching the advanced level of technology required to make the EC competitive with the United States and Japan. The trade battle of the century seems to be shaping up between the "world giants" (AT&T, IBM, Fujitsu) and the EC "national champions" (Alcatel, Siemens, Philips).

IBM dominates the computer hardware market in Europe, but local national champions run a close second in each country. Groupe Bull, Siemens, Olivetti and Philips have had to dilute their R&D efforts across 12 sets of technical standards. After 1992 they will be able to reduce costs by about 30 percent through economies of scale in R&D, production and distribution. Lower costs and uniform standards will create an explosion in EC spending for office equipment. Development of complex pan-European teleprocessing systems will be both easier and more economical.

Finding good IT professionals to implement these new Eurosystems will still be a major problem in Europe. CIOs will find that personnel turnover rates are higher in Europe than in the United States, but they will also find that the competence level of European professionals is excellent. European companies generally treat their IT people as an integral part of the overall business team. Consequently, European professionals tend to have a broader understanding of underlying business issues and objectives.

European systems standards have not yet been fully developed. For example, the EC is still agonizing over EDI standardization. ODETTE has achieved some success as an automotive industry EDI standard, but there is still no broad acceptance of standard protocols in most industries.

The telecommunications industry in Europe is moving rapidly from a position of fragmentation, protectionism and monopoly to unification, free-market entry and first-mover advantage.

Most companies based in the United States will either be exporting to the EC or coordinating operations with an EC affiliate or subsidiary. Vastly increased communications capacity between the United States and Europe will be required to support these operations. Private satellite channels seem to be a reliable alternative for linking U.S. and European facilities. Fortunately, many U.S. companies are now providing these necessary services in cooperation with European PTTs.

Major EC Projects in IT

PROJECT	OBJECTIVE	PRICE TAG
ESPRIT	Develop capabilities in CIM, software, broadband communications, IT and office equipment	$1.7 Billion
RACE	Develop integrated services digital networks (ISDN)	$578 Million
STAR	Develop communications infrastructure in less-developed areas of the EC	$1.6 Billion
APOLLO	Develop satellite system for high-volume digital data	not available

SOURCE: CHARLES FITTS

Costs are reasonable, too. A 112-kilobyte data line between North Carolina and Sweden costs $11,000 per month, while a 512K satellite channel costs $31,000 per month. That's 4.6 times the capacity for only 2.8 times the cost. Another advantage: The satellite channel simultaneously handles data, voice and video transmissions.

In mapping out new Eurosystem strategies, companies should first identify those policy areas that will be most affected by the EC '92 reforms. Here are some of the more important examples:

Organization structure: For maximum benefit from economies of scale, most organizations will form strategic mergers or alliances. U.S. firms will either directly invest in EC facilities or work closely with EC affiliates. Systems plans should consider the impact of these new organizational philosophies.

Facility consolidation: Companies will no longer have to locate facilities solely with regard to national borders. Plants will be located based purely on economic considerations. The resulting consolidation of facilities will mean longer supply lines to customers. Systems must accommodate these changes and handle the required data communications efficiently.

New distribution patterns: Reduced border delays and fewer transportation restrictions will significantly reduce transportation costs. Distribution centers will be consolidated and will handle fewer stock-keeping units. Inventory levels will be lower. Systems should consider these new patterns and support pan-European order-processing and inventory-control systems.

Brand consolidation: Uniform technical standards and greater mobility between countries will lead to greater standardization of brands. Advertising for these "Eurobrands" will be developed on a pan-European basis. Marketing support systems should provide for efficient handling of consumer preference and point-of-sale data from all EC locations.

New consumer patterns: Cultural preferences will remain, but receptivity to new ideas will increase with greater transborder mobility. Increased transborder shopping may lead to Sunday business hours. Removal of tariffs will open the way for direct mail and telemarketing as key marketing techniques. Systems should support new methods and conditions for doing business.

New price structures: Value-added tax (VAT) structures will be harmonized across the EC, and price levels will tend to equalize from country to country. Price elasticity will change demand patterns for many different products, increasing demand in some countries and decreasing it in others. Systems should provide for quick response to demand changes.

EC '92 will bring both problems and opportunities for U.S. firms. A key requirement for success will be the ability to understand the emerging European spirit of internal cooperation and to quickly translate this knowledge into meaningful change. CIO

Charles Fitts is manager of corporate MIS at Volvo GM Heavy Truck Corp. in Greensboro, N.C.

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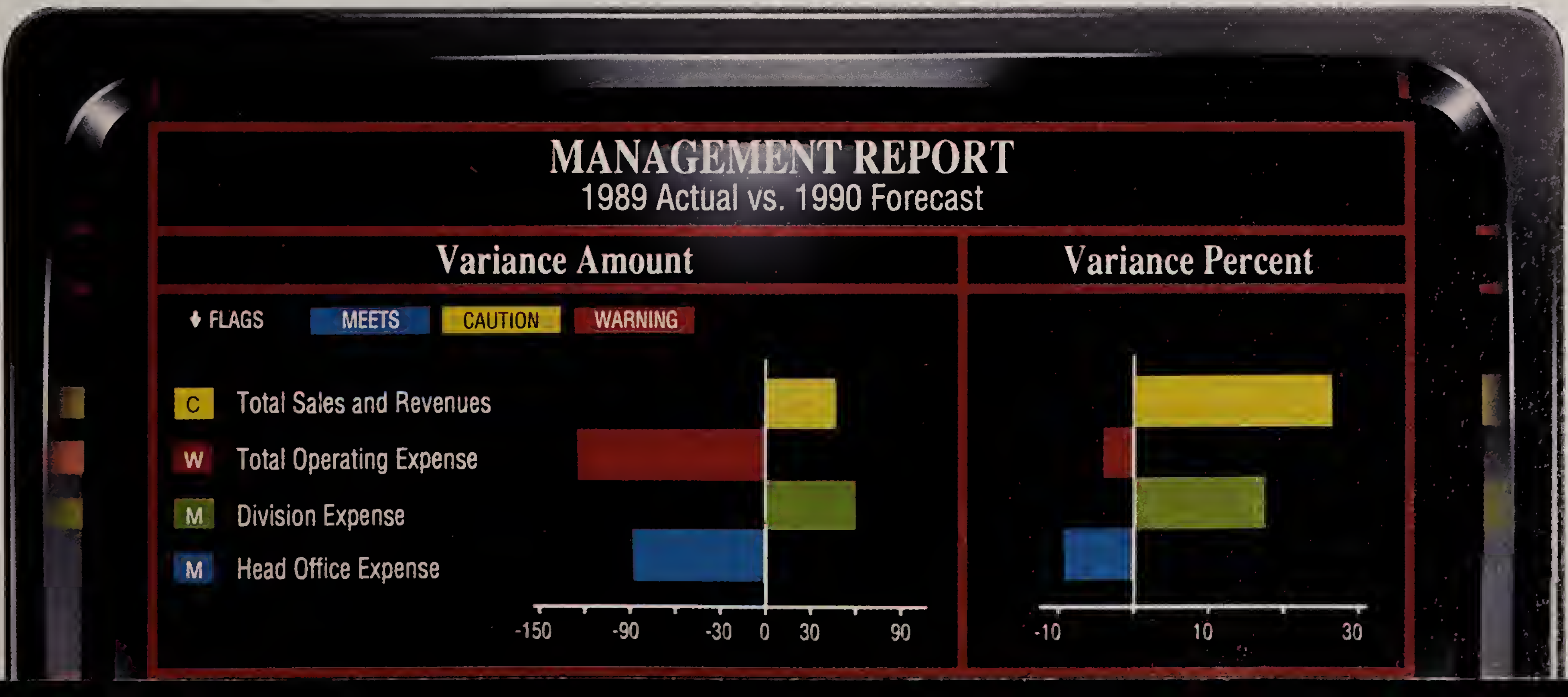

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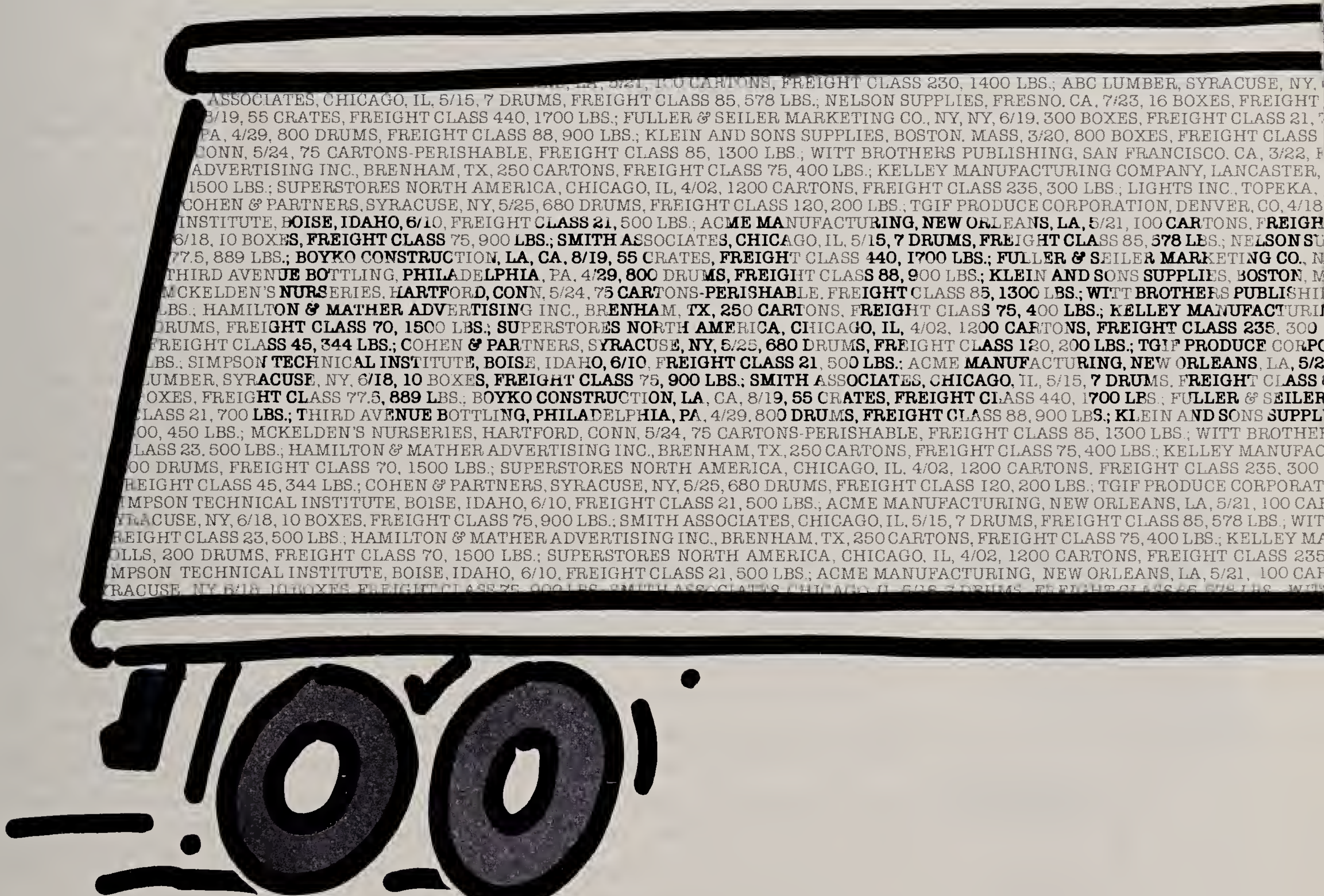
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TRENDLINES

SOFTWARE PIRACY

AVAST, MATEYS! PREPARE TO BE BOARDED!

It's time for corporate America to police itself for software piracy, says the Software Publishers Association, a nonprofit organization of software professionals and users based in Washington. But until America complies, the SPA is giving suspected pirates two choices: submit to an SPA audit and probable penalties or be sued for copyright infringement.

In the United States, piracy of PC application software amounts to about $1.5 billion a year, according to the SPA.

ILLUSTRATION BY BETHANY GULLY

As part of its battle against piracy, the SPA last fall set up a hot line to receive tips on corporations that were pirating software. When the group gets a tip, it sends an overnight letter to the senior management of the company asking them to submit to a software audit.

The audit involves printing out hard-disk directories and comparing them to the purchase records of the company. If the copies outnumber the purchases, the company must destroy the illegal copies and then pay for them twice: once to buy replacements and an equal amount as a penalty to the SPA's Copyright Protection Fund.

Of the 27 audits conducted by mid March, the SPA found pirated software in all but one, according to Mary Jane Saunders, SPA's general counsel. The settlements that the SPA has negotiated have averaged from $20,000 to $50,000 for each company.

Of course, the SPA can't force a company to submit to an audit, but the threat of a lawsuit tends to open doors. Saunders said that the SPA has the legal authority to demand access to these corporations' records as a representative of business software companies. She has signed statements from each member of the SPA that give it the right to perform corporate audits and to settle copyright-infringement claims on their behalf.

To encourage corporate managers to audit their IS departments on their own, the SPA is offering a self-audit kit. In addition to finding out whether the department has pirated software, an audit has other benefits for corporate management. "They find out a lot about their company by looking at what people keep on their computers," Saunders noted.

But at this point the chief motivation to conduct an audit is probably to avoid the wrath of the SPA, which is not above such subtle scare tactics as reminding corporate managers that hot-line tips usually come from disgruntled former employees.

For a self-audit kit, call the SPA at 202 452-1600. ▬

CAREER MOVES

MICHAEL S. HESCHEL has been named chairman and chief executive officer of Security Pacific Automation Co., the information services and operations support subsidiary of Security Pacific Corp. based in Los Angeles. Heschel replaces John P. Singleton who was promoted to chief operating officer of the parent corporation in January. Previously Heschel was the director of management science and information services at American Hospital Supply Corp., and he was appointed corporate vice president at Baxter International Inc. of Deerfield, Ill., following the merger of AHS and Baxter Travenol in 1985. While at Baxter, Heschel was responsible for worldwide information services and computer operations. In his new position, Heschel reports to Singleton and oversees a staff of over 6,000 employees at more than 30 locations worldwide.

MICHAEL SIMMONS is moving cross-country in the other direction, from the San Francisco-based Bank of America to the Bank of Boston Corp. Simmons will fill the combined role of group executive and executive vice president of technology and operations—a newly created position—at the bank holding company. He is leaving the post of executive vice president of BankAmerica Systems Engineering. ▬

STANDARDIZATION

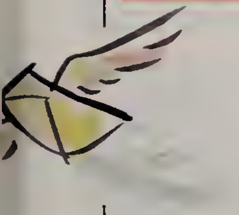
SPEAKING WITH A SINGLE VOICE

Sometimes when you want something done right, you just have to do it yourself.

This was the attitude adopted by The Coca-Cola Co. two years ago when, frustrated by the incompatibility of its two voice-messaging systems, it met with their vendors, VMX and Rolm, to see if they could work out a solution together. The vendors argued that it was too big an undertaking to do for just one customer, so Coke banded with five other major users to make it worth the vendors' while. That gang became an official organization called AMIS (Audio Messaging Interchange Specification), dedicated to developing standards to allow virtually any voice-messaging system to talk to another. Other founding members included Eastman Kodak Co., The Travelers Co., Amoco, Johnson & Johnson and surgical supply manufacturer Ethicon.

These users invited major voice-messaging vendors to sit down and talk about their needs. The vendors had mixed emotions at first, according to Roger C. Benson, formerly the voice-mail network manager at Kodak and now in voice-messaging development at Digital Equipment Corp. "They were afraid of market and price erosion," he said. But there was enough interest in the plan from large users that the vendors decided to play ball.

Compatibility between voice-messaging systems was important to AMIS members because it would offer them



TRENDLINES

the ability to send messages to remote offices with different systems and to migrate more easily to new voice-messaging systems. It would also open up marketing and customer-service applications by allowing them to send voice messages to clients. Benson makes the distinction between voice messaging and call answering. "We don't want to call someone on the phone," he said. "We just want to send them a message." That message could include data as well as voice.

AMIS now numbers 37 companies. While the majority of these are Fortune 500 user companies, the group also includes every major voice-mail vendor as well as service bureaus and consultants. So far AMIS has completed a basic analog specification and a "very robust" digital specification, Benson said, and they are about to begin voting on them. ▬

AUTOMATION

LICKING THE HIGH COST OF MAILING

Business now generates 90 percent of all mail—a volume fast approaching 200 billion pieces a year. To help cope with this avalanche, the U.S. Postal Service (USPS) rewards attractive discounts to customers who can prepare their mailings in ways that expedite automated USPS handling, in effect taking on some of the Postal Service's processing burden.

Consequently, "production mailers"—highly mail-intensive businesses such as banks, utilities, credit-card companies and mass-market retailers—have plenty to gain from implementing technology that can save them pennies per piece.

To that end Pitney Bowes, the company that pioneered the postage meter, has created PostEdge, a new mailroom system that is designed to help companies control and monitor their front-end costs as well as meet the Postal Service's discount requirements and assure conformance with long-range USPS automation plans.

When combined with Pitney Bowes machinery that folds, stuffs and inserts correspondence in envelopes, PostEdge amounts to a kind of value-added, computer-aided mailing expert. In addition to affixing postage, the system enables mailers to bypass the costliest USPS sorting operations by applying postal bar codes and expanding zip codes to nine digits. For high-volume bulk mail (much of which is not actually stamped), PostEdge enables creation of a mail manifest that certifies the full content and postal value of the bulk mailing, earning the mailer the highest USPS discount.

The system also includes a report-generating feature that audits traffic and costs by job and creates all required USPS documentation. Finally, the system enables electronic funds transfer of postage payments, so that mailers can practice just-in-time cash management of postal expense.

Pitney Bowes claims that mailers who use the bar-code printing feature alone can save $1,000 a day on 200,000 pieces of mail. Those who can qualify for the maximum USPS discounts could save as much as four cents per piece of mail after the postal rate increase goes into effect next year.

Among the charter users of PostEdge is US Sprint's new data-processing and billing center in Rancho Cordoba, Calif. ▬

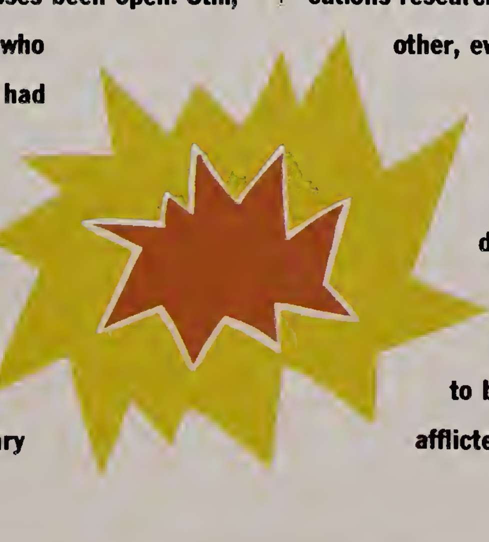
ILLUSTRATION BY BETHANY GULLY

CRASH COURSE

When the sky falls, the best thing to do is to admit it in a hurry and go on from there.

This was AT&T's approach to dealing with the January 15 system crash that disrupted its long-distance service. And according to a study of Fortune 500 customers of AT&T by the Business Research Group (BRG) in Newton, Mass., the company's quick and forthright response to the problem limited the potential damage to its business.

Of course, the fact that the crash occurred on Martin Luther King day meant that the impact was considerably less than had all businesses been open. Still, roughly half of the respondents who were open said that the outage had a major effect on their business. Seventy-five percent, however, said they were satisfied with AT&T's overall response, 89 percent indicated that they had no plan to switch to another primary carrier, and 78 percent said they had no intention of lessening their use of AT&T services in the coming year. As for perception of AT&T's overall reliability, 73 percent of respondents said their confidence was not shaken by the January event. Only 27 percent said that they would seek to recoup losses attributable to the crash.



The BRG survey unearthed a high degree of compassionate understanding among AT&T customers that these kinds of things sometimes happen, according to Paris Burstyn, BRG's director of telecommunications research and consulting. "At one time or another, every business experiences a problem that disrupts customer service," said Burstyn. "The long-distance companies, including AT&T, are no different, and their customers recognize that." In fact, 96 percent of respondents considered the disruption to be an isolated event that could have afflicted any carrier. ▬

TRENDLINES

NEW VENTURES

The accounting and consulting firm of Price Waterhouse and database maker Ingres Corp., of Alameda, Calif., have inked a joint marketing and subcontracting agreement. Under the terms of the pact, PW consultants will offer Ingres relational-database users help in developing large-scale custom business applications built around the Ingres database.

The consulting services are available to Ingres customers at a fixed fee discounted from PW's regular rates, according to Cynthia LeCornu, director of public relations for Price Waterhouse's Management Consulting Division. Beyond the price break, however, LeCornu cited the benefit to users of PW's close relationship with Ingres, insight into the company's future direction, and the PW consultants' special training in the range of Ingres product offerings.

As to the benefits PW anticipates out of the arrangement, LeCornu said, "We see a significant market for this. But the focus . . . is not just the dollar figure, but the ability [of Ingres] to port [to multivendor platforms] and offer enterprisewide solutions, which is what our clients are looking for."

HONOREES FOR CONSCIENCE, EXCELLENCE

At two recent galas, awards were bestowed for the exercise of conscience in computing and for excellence in technology management.

On March 19 at the Information Systems Security Association conference in St. Louis, **DR. WILLIS H. WARE** became the first recipient of the Conscience in Computing Award. The award, which includes a $1,000 cash prize, was presented jointly by the consulting firm of Ernst & Young and the National Center for Computer Crime Data.

Ware was honored in recognition of his work as an advocate for protecting personal privacy and maintaining military security in the age of the ubiquitous computer.

Ware, who works at the Rand Corporation in Santa Monica, Calif., has been concerned for nearly three decades with the social consequences of computing. During the 1970s he was chairman of the Health, Education and Welfare Department's Committee on Automated Data Systems and served on the Private Protection Study Commission. Ware continues to advise the federal government on ethical issues surrounding technology use.

DAVID T. KEARNS, chairman and chief executive officer of Xerox Corp., received the sixth annual Excellence in Technology Award at the Conference Board's Information Management confab in New York last month. The award, started by the Gartner Group, honors a CEO from a Fortune 250 firm who demonstrates outstanding leadership in deploying IT within the organization. Accepting the award for Kearns, Xerox President **PAUL ALLAIRE** said, "We will not be successful in world markets unless we change our organizational architectures and corporate cultures. The scope of that change is not possible without the application of information technology."

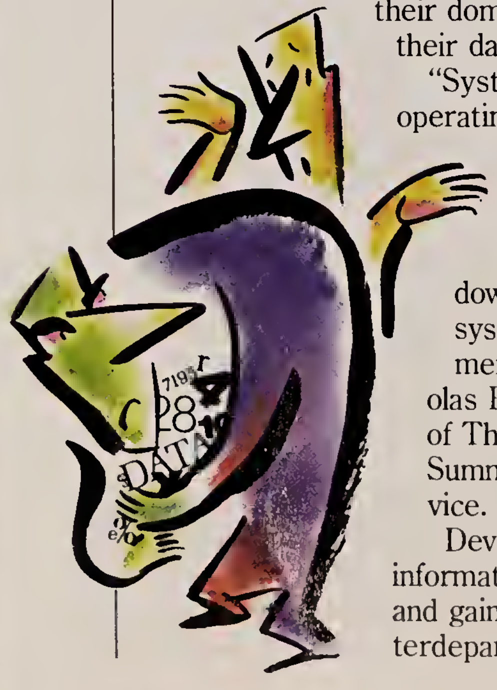
ILLUSTRATION (LEFT) BY BETHANY GULLY ILLUSTRATION (RIGHT) BY JONI LEVY LIBERMAN

STUDIES

DO TURF TUSSLES STUNT TECH GROWTH?

A new survey by The Index Group, a consulting firm in Cambridge, Mass., suggests that the people who develop corporate information systems find themselves in a troublesome organizational bind: wanting to build broad new systems that cut across departmental and functional frontiers, but confronting end users who instead seek to protect their domains and hoard their data.

"Systems developers are operating amid turf battles, historical bickering, low credibility and the difficulty in pinning down ever-changing systems requirements," said Dr. Nicholas P. Vitalari, director of The Index Group's Summit advisory service.



Developing a corporate information architecture and gaining support for interdepartmental or cross-functional systems are the two top operating priorities of the development directors who responded to the survey. But while these developers are poised to bridge the data gaps in their firms, they also acknowledged that end users seldom cooperate with their designs. Two-thirds of the development directors called end users' unwillingness to share data among departments "a major problem."

Another finding along the same lines: a growing split between development specialists in the IS groups and computer-literate end users. In 74 percent of the organizations surveyed, end users are increasing their own systems-development work. In the face of this rising tide of end-user development activity, 78 percent of the development directors said that coordinating the end users' efforts and integrating them with professional systems developers is "a major challenge."

Sixty-nine percent of development directors say their staff is regarded as a "purveyor of technical solutions rather than business-oriented solutions."

Summit sent out 215 questionnaires to systems development directors employed at Fortune 500 companies; 95 were completed.

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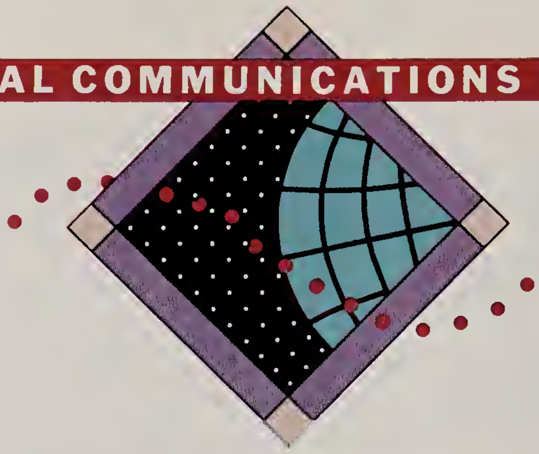
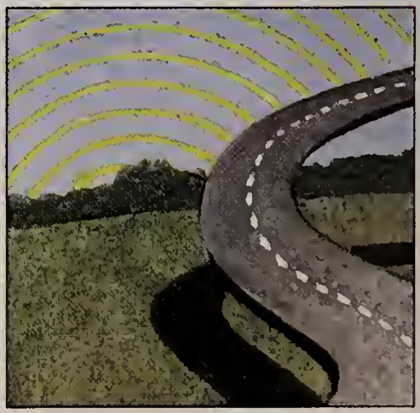


The Quest For Clarity

Telecommunications is more than an important responsibility for CIOs; it's an extraordinarily difficult and confusing burden. Increasingly, CIOs are taking over the telecommunications function. Roughly 90 percent of last year's CIO-100 had telecom within their purview.

But as we have heard time and again, both in private conversations and at public conferences, CIOs are having a tough time getting the hang of managing this function. "[It's] probably the most difficult problem we're facing right now," said Ronald Vidmar, manager of the data network of the State of Ohio. "There's too much confusion. There are too many unknowns about standards and manufacturers' network-management products."



Few from IS have a background in communications, and vice versa. "Very few CIOs will have come up through telecommunications, but all see it as a key strategic area," said Peter G. W. Keen, the executive director of the Washington-based International Center for Information Technology. "And very few people from telecommunications have enough insight into IS to help them much."

"The CIO needs to feel it's OK to be confused," said Gus Bender, second vice president of telecommunications at The Travelers Insurance Companies in Hartford, Conn. "The confusion comes from the fact that there are two cultures out there: a DP culture and a telecom culture. People raised in each culture think differently. Their values are different. Their approaches to problems are different. . . .

"I have both data and telecom responsibility here," Bender added, "and though we've merged the two organizations, sometimes its not easy to get the two sides to talk to each other."

There are many other reasons CIOs find the field so confusing. Terminology, for starters. "One term in DP means something different in telecommunications," said Bender. And even when terms do not differ, the alphabet soup of telecom standards and protocols sounds like a mind-numbing technobabble to those brought up on computerese.

And what of the more substantive differences? "I don't understand why everything has to be different," said John Drahzal, MIS director of Cannondale Corp., a bicycle manufacturer in Georgetown, Conn. "I'm confused about what telecommunications services, equipment, standards and protocols really do and can't do. What can be connected and integrated, and what cannot? Single-vendor services sound tempting, but is the promise for real?"

Keeping track of communications services and products is a tough job. Not only do vendors compete in this marketplace, but technologies do too. There are many different ways to get a byte of data from Point A to Point B. And costs, rate structures and technical capabilities change so quickly that decisions are often based on guesstimates, not estimates. "We need to improve our comfort level on what is real and what will be imaginary over the next three years," said Richard Koeller, vice president of information technology at Whirlpool Corp., of Benton Harbor, Mich.

Last but not least, CIOs frequently complain that vendors are taking advantage of all the confusion and muddying the waters even more by making exaggerated, even contradictory, claims about their products and services.

And so while it may be OK to be confused, as Bender observed, it's certainly no picnic. The task we've set ourselves in this special issue is to bring some clarity to a murky field. Our goal has been to identify the questions CIOs must ask and the issues they must consider in order to build and manage successful communications systems and organizations in the next few years. This is more than just a collection of articles about communications. We believe that together they constitute a guide for the perplexed.

Those who have already scouted out the path make the best guides, of course. So we've captured the thoughts of six highly regarded IS executives in the issue's keystone article: an edited transcript of a three-hour roundtable discussion of communications issues. The CIOs were joined by an equal number of communications consultants and vendors. The discussion was moderated by Peter Keen.

As expected, each CIO had found a way for communications to make a real difference in the lives and competitive outlooks of their companies. To our surprise, they agreed on the major managerial issues they face. A by-product of this discussion is a communications "manifesto" for the 1990s, prepared by Keen, that bears scrutiny by CIOs and vendors alike.

When we began to plan for this issue, we asked IS and telecommunications executives what subjects they felt should be covered. Their suggestions broke down into three broad subjects: They wanted to find what communications experts and their own peers viewed as the leading communications management issues for the 1990s; they wanted to know about opportunities for reducing the expense of running a communications operation, now and in the near future, as the costs of products and services change; and they wanted to hear about new technologies that will enable important new applications. Those suggestions are embodied in our three features stories. In addition, we have included portraits of three IS executives: David Edison at Westinghouse Electric, James S. Marston at American President Companies and David Starr at Citicorp. These portraits look at how specific CIOs wrestle with the issues discussed in the features.

Readers, we also found, were interested in learning more about what lies in store when they try to create a global network for their corporations. Charles Fitts of Volvo GM Heavy Truck Corp. has written an account of the opportunities that are available in the impending unification of Europe.

Finally, *everyone* seems to be befuddled by the confusing terminology and numbing acronyms of communications nomenclature. We hope that our fog-cutting reference section, put together with Datapro Research of Delran, N.J., will help make sense of communications standards, terminology, services and those supposedly "compatible" systems that often aren't.

Will this special issue give CIOs all the answers they need to run a corporate communications network in the 1990s? Of course not. But we hope that it will at least help them to identify the crucial issues and perhaps serve as a useful reference guide as they plot their own courses in the years ahead.

—A.E. Alter

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ROUNDTABLE

Can We Talk?

We sure can. Whoever said 'talk is cheap' never hosted a teleconference among heavy-hitters in the telecom field. Imagine that the phone is ringing. . . . You're about to join a discussion on the present and future state of the art of telecommunications . . .

In contemplating the likely contents of this special telecom issue, we began where many of our readers admit they find themselves when they think about telecommunications: in a state of confusion. It's probably futile to try talking your way out of confusion, but we decided that a roundtable encounter among some of the best and brightest telecommunications users, vendors and consultants might at least clarify the points of order and disorder, agreement and disagreement.

Peter G.W. Keen

When we began looking for a moderator for our roundtable discussion, Peter Keen immediately came to mind. As executive director of the International Center for Information Technologies (ICIT) in Washington, Keen commands an eagle's-eye view of the state of the art.

According to Keen, the participants of our roundtable have accurately set forth the needs and issues in communications today—with this caveat: "There can be a five- to 10-year gap between the problems the leaders are working on and the problems the laggards are working on. The views expressed here are probably not representative of the average company, but they are representative of the best companies and the best IS managers. A perfect example is the emphasis on end-to-end network management. The average CIO might not consider that a priority."

Keen shared participants' concern about the shortage of managers prepared for a world in which "you can't talk about advanced IS without also talking about advanced telecommunications. Very few CIOs have come up through telecommunications, but all see it as a key area. And very few people from telecommunications have enough insight into IS to help them much. Where is the new generation of managers going to come from?"

While our roundtable participants may be ahead of the curve, Keen said, "readers should pay attention to what they have to say. Even if you are not working on these issues now, these guys are in spades."

PART ONE

INTRODUCTORY REMARKS

Keen: Where has telecommunications fundamentally changed your companies' competitive and organizational dynamics? Will it continue to do so in the 1990s? What are the big issues for you?

Leonard Cohn *(vice president of information systems and telecommunications, Monsanto Co., St. Louis)*: Telecommunications has made a difference several-fold. We have experienced improved reliability and lower costs in the past decade. It made it possible for us to feel comfortable with distributed computing, because we felt we could move data, text, voice—anything—with credibility and integrity anywhere in the world at a minimal cost. And it has changed how groups of people work together.

Mark Teflian *(vice president and CIO, Covia, Rosemont, Ill.)*: We have realized cooperative computing to a certain degree, so that in the long term we could grow our business from a functional capacity standpoint despite the exponential growth in the number of transactions and their complexity. We now have implemented databases and applications that not only create new business functionality for point-of-sale and customer use, but also integrate decision support, online transaction processing, and car and hotel systems as well as airport computing.

The network is the mechanism for the sale of our product. We do not even have an application that isn't network-based. We've been able to manage our costs and even improve our unit costs, and because we've gone to a digital network, we've been able to use disparate systems and integrate them for the end user. We've taken personal and corporate productivity a little higher because tying together disparate databases facilitates quality decisions and communications.

John Nastro *(senior vice president of worldwide communications, Chemical Bank, New York)*: Almost all our banking activities depend upon telecommunications. Telecom is now a front-office business issue. As a consequence, educating and advising senior managers and business managers about telecom functions and capability is a major issue. You want them to have complete and accurate knowledge. That requires us to get closer and closer to the business units to provide that information.

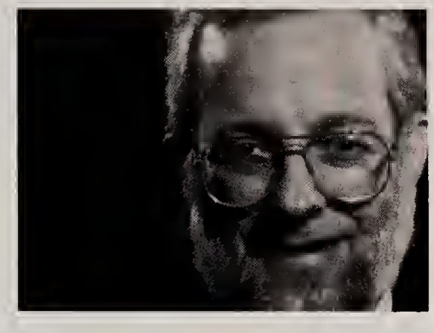

PHOTO BY JACK VAN ANTWERP

> **Vendors should continue to pay a lot of attention to common standards and take into account life-cycle costs to the customer when they introduce new technology—which should be easy to use, reliable and not manpower-intensive.**
>
> *—David Edison*

We have greater involvement now in the business areas because most business managers see their dependence on telecom. This causes us a great deal of concern about the quality and reliability of the service, costs, speed and getting the proper resources devoted to the business unit.

James Marston *(senior vice president and CIO, American President Companies Ltd., Oakland, Calif.)*: We are an Asian, particularly Pacific Rim, shipping company and a domestic train and truck company. We have taken our network into many countries where networking is not the typical way of doing business. That has empowered our people in some remote areas to participate more in the day-to-day activities of the company. When we decide how to deploy our ships, the individual in Dubai or Fujiara who will live with the way we do it can now participate through the network.

We are employing some voice-data integration techniques in less than T1 bandwidths in Asian countries. This allows us to interface with our customers in many ways. They can use our systems through automated voice response, electronic data access using their own personal computers, and EDI transactions. And we can notify customers of the arrival of shipments by fax. The network has brought our company closer together even though we operate globally. At the same time, it has allowed us to strengthen customer loyalties.

David Binko *(director of academic computing, Johns Hopkins University, Baltimore)*: Johns Hopkins is a research-oriented university, and we are geographically distributed. We have centers all up and down the Baltimore-Washington corridor, in Europe, and as far away as Nanking, China. IT is critical to our business.

In the 1970s we began to see this thing called distributed computing. Note that I didn't say "network," I simply said "distributed." There was a lot of redundancy and inconsistencies. Because we were geographically dispersed at Johns Hopkins, we tended to distribute IT resources. They became redundant and very expensive.

As we moved into the 1980s, networking began to impact computing and information technology. It became diffused—distributed and loosely coupled. At the same time, we saw a hierarchy develop from electrical connectivity to software connectivity to the nebulous thing called information connectivity. The dichotomy is that we have been concentrating on electrical connectivity whereas our constituents have been concentrating on information connectivity.

We have a credibility gap.

David Edison *(executive vice president of Westinghouse Communications Systems Division, Westinghouse Electric Corp., Pittsburgh)***:** Telecommunications has enabled us to operate as a multinational corporation and to maintain modern manufacturing standards and practices. For example, we can practice just-in-time manufacturing techniques, even though our plants are 1,300 to 1,500 miles apart. It also allows us to project our computer power where it is needed. Our defense research-and-development center in Baltimore is able to use the supercomputer here in Pittsburgh. And some of our new products are based on communications technology: Monitoring systems for electric-utility generating equipment are made possible by remote connection to turbines.

Communication between management levels has improved, partly because of E-mail, partly because of voice mail. This has improved our competitive advantage as a whole. Plus, with mobile cellular phones, executives can still conduct another 20 minutes of business as they go home at night.

Keen: Let's switch to the vendors. What are you going to be able to provide that significantly deals with these issues?

Gail Daniels *(manager, Network Marketing Group, Digital Equipment Corp., Littleton, Mass.)***:** The client-server model, as it has been promulgated in the industry, has focused on hardware. I believe the client-server model in the 1990s will focus on providing services to the end user. The focus will be on the application, on what the end user needs. The user shouldn't have to know what hardware or software makes up the network. The effective utilization of network management will be critical. And clearly, in a multivendor standards-based world, no one vendor will necessarily dominate the infrastructure. Adherence to standards is critical.

Vendors should focus on coherent computing—which is a combination of distributed computing and networking—if we're going to start talking about really integrating voice, data and video.

—David Binko

Alan Rehert *(director of strategic planning, AT&T, Bernardsville, N.J.)***:** It may be a bit of a cliché, but I think the key is going to be listening to customers in depth. I think the migration to voice, data and image integration—first at the bandwidth level and, increasingly, at the signaling level—is going to be important, so information about who is calling and access to data in others' computers can be standardized. We're seeing this already in customer-service functions where database access occurs before operators talk to customers or suppliers.

In the area of interfacing with vendors, EDI is going to be increasingly important. Infrastructure is probably the most visible issue, particularly in moving to the next generation of computing and communications. The continuing need for standards has been mentioned. All these areas are going to be focal points of the '90s.

Keen: Defining standards is complicated enough, but implementation in computing is just a massive effort. Let's move to one of the massive players. Ron Williams, is IBM a telecommunications company or a computer company? Where do you see this going from the point of view of making a difference to businesses?

Ron Williams *(manager of telecommunications account marketing, IBM Corp., Raleigh, N.C.)***:** Yes, we're a telecommunications company and yes, we're a computing company. One thing that comes through loud and clear is we don't know how to differentiate the two anymore. I am also hearing loud and clear this whole focus on business integration. What we're really doing with computing and telecommunications combined is to enable the business to do what it needs to do.

Vendors should make products more flexible. We want something as free-flowing as the electricity that comes through the wall socket. We want to be able to move quickly, because windows of opportunity for trading applications are very small.

—John Nastro

We are just coming into this whole concept of cooperative processing. Today we are absolutely not doing the right job for the user in a confusing, complex environment. What we've got to find a way to do in the '90s is to provide the user with an environment where the system and the network are absolutely transparent. All the user sees is the application and the information he's looking for.

Our concept was a technical one to start. Now we're beginning to understand what the business really needs from a cooperative standpoint. It's only when we begin to put cooperative processing into business terms that it makes any sense.

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> **In the 1990s standard-setting will be critical, but it won't be the only solution to the problem [of interoperability]. You're going to see more alliances and partnerships in the industry. I don't believe we're going to solve this problem in the next five years.**
>
> *—Gail Daniels*

David Friedman *(assistant vice president of business marketing and new product development, Ameritech Services, Schaumburg, Ill.)*: I agree with the need to change from a technology focus to a customer focus. As we enter the '90s, I would characterize our approach as one of intelligent activity through mass customization. The goal is to allow users to get the bandwidth and functionality they need from their interface with the RBOC. We see dynamic bandwidth playing a part in giving you what you need: fiber to the home or office allowing massive bandwidth, virtual networking, multimedia communication on an interactive basis. We would do this through the technologies such as switch multi-megabyte service, LAN interconnectivity, broadband ISDN and higher-speed packets we call the asynchronous transfer mode.

There will be a shift in focus to business applications. And we agree that alliances with vendors and even with some of our competitors are important.

Keen: Let's go on to the two consultants. Howard Frank, what's your view, bridging the demand side and supply side?

Howard Frank *(chairman and CEO, Network Management Inc., Fairfax, Va.)*: I agree with virtually everything everyone has said. Unfortunately, I see the difficulties accelerating because, as usual, the technology of information is developing at a faster rate than the technology of managing information.

What we're now trying to figure out is how to manage connectivity. The largest problem we're beginning to face is incompatible software. When you have 10,000 users with PCs hanging off the network, just keeping track of software releases becomes a significant network-management problem. Maintaining directories becomes a fantastic problem. These aren't the kinds of things that anybody is really worrying about now, but I think in just two or three years from now these are the issues that will take networks down. We'll see lots of problems in large networks in the future.

Vincent Barrett *(managing partner, Network Strategies Advisory Service, Ernst & Young, Fairfax, Va.)*: Telecommunications managers today are having greatness thrust upon them. The big issue that is driving everything at this point in time is discontinuity—both technological and organizational. The technological discontinuity is being driven by microcomputers and, to some degree, minicomputers, distributed computing platforms and the network itself. There's a general uncertainty as to what will be the winning technologies or standards. These problems are further compounded by vendors, who are using the standards bodies as competitive battlegrounds and market posturing positions.

From an organizational point of view, there is an equally serious discontinuity. Departmental autonomy has risen from being an organizational anomaly to being a reality in most organizations today. Upper management—the CIO level and above—generally feels that what we call "departmental autonomy" is, in some instances, chaos. There is a real desire to bring law and order into these technology platforms. LANs are a very critical area for gaining some sort of architectural continuity in management control.

I do not believe that many telecommunications organizations today are up for the challenge. In many cases, the departmental management they're having to deal with can outgun them in the new technologies. And this is, by the way, the reason I believe there is a resurgence and interest in outsourcing and what I'd like to call mini-outsourcing—a humbler version of what we've seen with Kodak. I believe telecommunications managers need propping up. This kind of mini-outsourcing provisioning capability to deal with new technologies is seen as, if nothing else, a stop-gap measure.

PART TWO

FREE DISCUSSION

Keen: I'd like to open this up now for free-ranging discussion. There are a few things I'm interested in. I'd like to pin down the key issue of cooperative processing—how to conceptualize it, what it is, etc. I'd like to look at the issue of network management from a business service point of view. I'd like to look at the question of organizational integration and MIS-telecom integration. Then I'd like to discuss the key things vendors really have got to do that are different from what they're doing now, and what vendors need from their customers.

Cooperative Processing

Keen: I suggest that Mark start off, because I would think Covia has gone as far as anybody has with cooperative processing. What is cooperative processing?

PHOTO BY CINDY CHARLES

Vendors should better articulate the benefits of tariffs, because right now too much of the burden of deciding whether a particular tariff is advantageous rests with the customer.

—*James Marston*

Teflian: Covia defines it as a mode where independent programs can run on multiple processors and across multiple types of transports to meet a business need. That allows us to choose where a specific function may occur. We absolutely need to move data and processes as close to the customer or the user of that information as possible. A cooperative processing architecture allows a business to construct portable applications.

Binko: I call this coherent computing. It's a combination of distributed computing and networking. It means using the right distribution of data across high bandwidth or low bandwidth where appropriate and putting the processing power as close to end users as possible.

If you want to envision what a network of the '90s will or should look like, look at a tightly coupled, multiprocessor mainframe of today like an IBM 309600 or an AT&T 3B4000 or a VAX 6000 series. There you have processors that are linked by very high-speed buses working together in a coordinated way. With sufficient bandwidth it shouldn't make much difference that the MIPs are being consumed on the desktop on the East Coast but the data is in Kansas City.

Teflian: We could build function into an intelligent workstation that can coherently interact with large mainframes or parallel processors irrespective of their location. Even if data is moved to the customer's location, the specific functional processes remain intact. It becomes an issue of addressing and bandwidth. So location independence means that the processes and data can exist separately or together.

In our business, we're very concerned about being competitive at the transaction workload level. We need to provide the most economical unit of computing for the function over time. That's why we need cooperative processing. We can't afford to be stuck with the high cost of applications or with a one-size-fits-all situation, where we can't customize an application.

Cohn: So this business of everybody today tending to say, "Well, we've gotta move the processing to the desktop," may or may not be appropriate.

Teflian: That's exactly right. We need to be able to choose what workload—what combination of function and data—should be moved to the desktop. In our business there will always be regional processes and there will always be local processes. Our goal is to do everything local that can be done local instead of having to export either workload or data. But we're not going to a world where everything takes place on somebody's desktop.

Network Management

Keen: Let's move on to the next topic, which is one of the key issues. It's what we mean by network management. I think vendors and telecommunications managers have often thought of network management as part of the operations side. What I hear Leonard, David and others say is that network management is about the end-to-end reliability of a business service.

What are the issues on network management? Howard, what do you see as the really critical agenda?

In the 1990s, standards must be defined and conformed to much more quickly in order for the products to sell. With X.25, the standards were in place fairly quickly, but it was the shaking down and allowing multiple X.25s to talk to each other that took so long.

—*Alan Rehert*

Frank: First, let me define what I mean by network management. If you think of the assets of the network as modem lines and boxes, network management is how to fix them when they break or how to keep them up. If you think of a network as a distributed computing platform, which I think everyone here thinks, then the assets include the applications, the databases—everything down to each human being on every terminal. Therefore it's not software or tools which are needed; procedures and concepts come first.

Keen: How do the vendors understand this?

Frank: The vendors are dealing with problems created by the proliferation of large systems in the 1980s: identifying what, where and when it broke and writing a change order or a work order. The trouble began with end users growing little departments that had no budgetary authority and no thought behind their design in any really strategic way. So we're left with processes that evolved in an environment that has radically changed. I agree with Vince: We're going through a giant discontinuity. The procedures and processes of managing these systems were evolved for essentially softwareless networks without applications.

Keen: Is this reflected in the rise of the systems integrators, many of whom are really systems plumbers, repairing the damage?

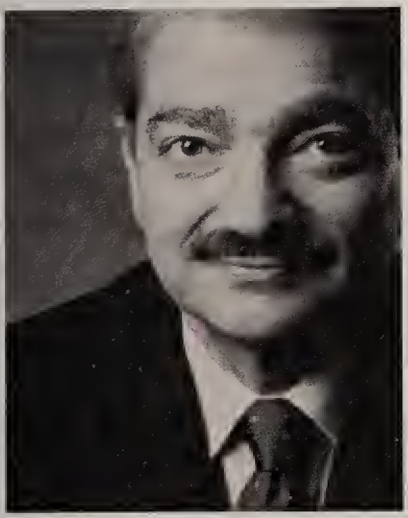
Frank: That's precisely right.

Barrett: Ad hoc growth of the network control center has been the norm. Tools, technologies and so-called interim throw-away devices never seem to get thrown out, because there's nothing reliable to replace them. What you end up with is a dependence upon a few individuals as opposed to reliable technology and a reliable set of safety-net procedures. So while a long-term strategic view of network management is critical, there exists a dangerous short-term tactical view on network management and its problems.

Nastro: But how do we make these things happen? How do we get the vendors, the standards boards, to actually understand what our needs and priorities are?

Frank: Number one, I don't think that it's a vendor problem. I think it's an end-user problem.

Nastro: But how does the end user protect himself? How does the end user implement a network-management system that takes care of all the



In the 1990s we'll solve some of the very hard connectivity problems, but compatibility will escape us and the situation will become very grave.

—Howard Frank

THE EXPERTS' MANIFESTO

We, the panel, declare these truths to be self-evident:

1. **Information technology is now a basic aspect of doing business.** We need a management attitude that reflects and promotes this fact, especially in relation to developing infrastructures that take fullest advantage of the technology resource.

2. **We are facing a period of discontinuity in technology and its uses.** We have a clear idea of what we are aiming for: a network that is transparent end to end and that is a truly integrated information resource. We will make consistent and continued progress toward that goal, but there are no quick and easy fixes.

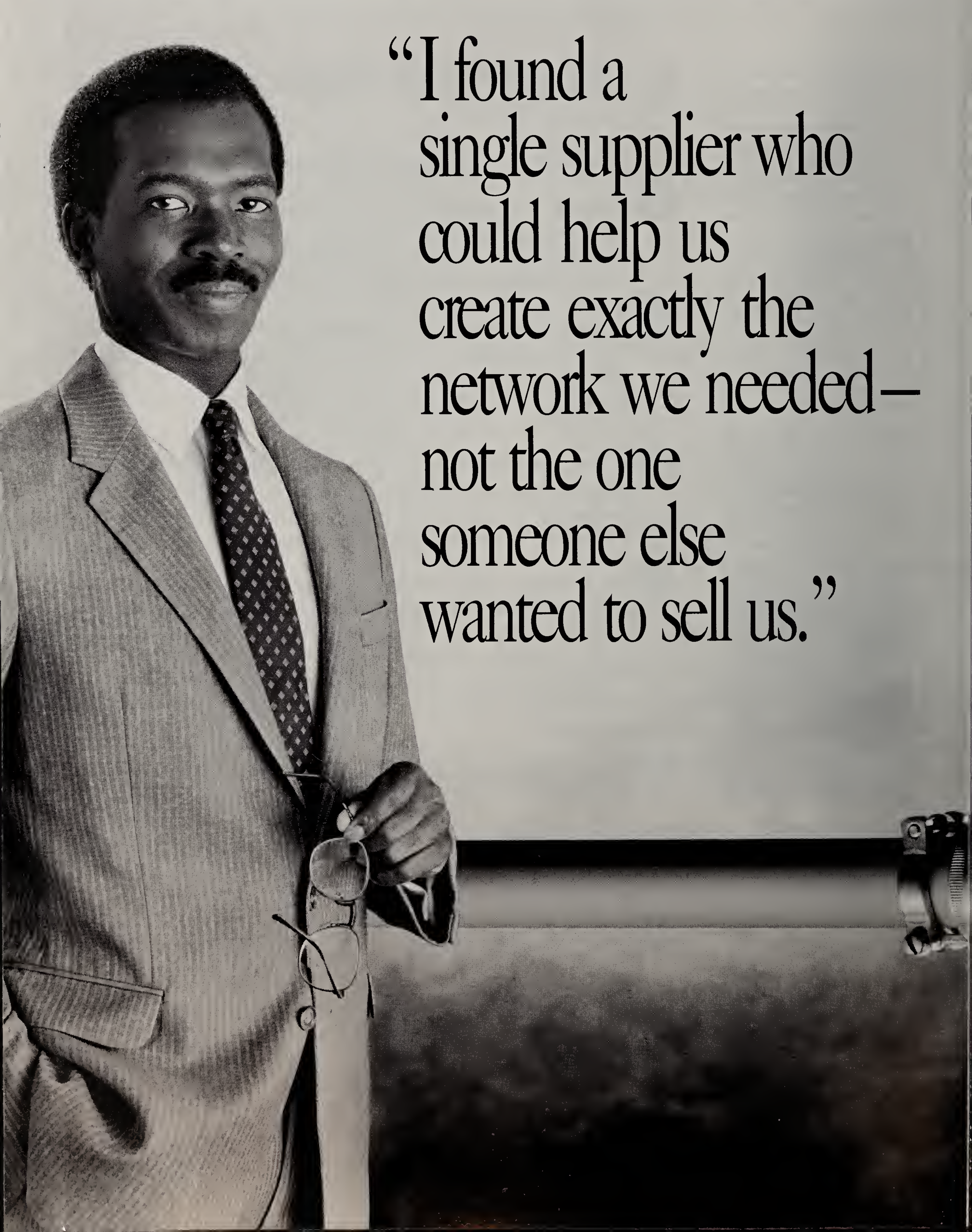
3. **Cooperative architectures provide the technical path toward business integration.** Cooperative processing involves the exchange of business processes, not just technical functions. Realization of cooperative processing is the practical path to integration.

4. **Full end-to-end network management, at the level of business services, is the single greatest challenge facing the telecommunications profession.** The network is a business asset. It is both a distributed computing system and a communications system. Network management is the management of the assets of the entire system, requiring long-term investment and a new professionalism.

5. **Human resources will increasingly either drive or block progress.** As technology becomes commoditized, we will rely more and more on expertise as the value-added element in every major aspect of planning, vendor relationships and strategic alliances. The shortage of first-rate talent to meet the demands for new business and technical knowledge and expertise is already alarming.

6. **The 1990s will be an era of collaborative necessity.** Real partnerships will be an essential element for progress and the basis for choosing strategic vendors. No organization will be able to do everything itself, particularly in areas that demand expertise that is scarce. For the partnerships to be productive, they must entail mutual and parallel development. This will require full openness about each other's two- to five-year plans.

—Compiled by Peter G.W. Keen



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In the 1990s the business application will provide the strategic advantage. The real goal for a telecommunications manager or telecommunications organization will be to play the role of an enabler, to be there for whatever direction the business application takes.

—Vincent Barrett

corporation's assets, including the software, for a reasonable amount of dollars?

Frank: That's what your problem is. What vendors do is provide tools. What users have to do is integrate those into environments. Relatively little planning has gone into putting these things together from an end-user point of view.

If you look at the multi-vendor, multi-application systems we have, I don't think you can expect any vendor, whether it is IBM, AT&T or anybody else, to come up with systems that will allow you to fully manage your own environment. You will always need to be the integrator of integrators or the designer of designers. Consequently, the end user has to start with a significant commitment of manpower resources to organize and plan for survival. Network management is not going to be an off-the-shelf box or a combination of a few boxes and pieces of software. Users have been relatively slow to recognize this.

Binko: IT managers have looked at network management as something that is magically going to come off a reel of tape from a vendor. When I look at network management, I'm also looking at aspects like defining and evolving local standards for the organization, as well as accounting, configuration control and security. I think it's really folly for us to expect that all these concepts are going to be magically provided for us as commodities from the vendors.

Barrett: I agree completely. This whole idea of the vendor handing a shop its network-management infrastructure is absolutely a myth. The only people that can possibly lay out the network-management infrastructure and architecture are the users.

Keen: This is Howard's point from the beginning, that users must think of this as a strategic corporate role instead of a sort of tactical add-on.

Organization Integration

Keen: If I may move on to the question of organization integration. Vince, you brought this up. There are a lot of IS guys who don't understand communications and a lot of data communications guys who don't understand end-user applications. How do you integrate the organization and the professions?

Barrett: First you have to bring all of the parties together face to face. I mean the users of the technology as well as the so-called managers, planners and custodians of that technology. I know it's cliché-ridden as hell, but we must have cooperative planning. Without that, I don't see how any of the technologies are going to move forward. A whole new way of planning and dealing with user needs has to be laid into place. A new model for service-level agreements with vendors has to evolve relatively quickly. On top of that, I think the respective roles of MIS and telecommunications departmental professionals need to be redefined.

Keen: You're talking about a coordinated strategic role with some clout.

Barrett: Yes. A good emerging analogy right now is the so-called capturing of the LAN/WAN. The router for LAN internetting has become a battleground as to where departmental autonomy ends and MIS control begins.

I don't believe the bigger picture is being translated very far down in the organization now. I see it at the CIO level, but as you move one or two rungs down the organization, the big-picture view starts to break up.

Edison: We've had the problems you've described. We put together a nifty little tool we call our network-management fitness review. It looks at your network-management skills from 12 points of view. It starts out with customer orientation, which is a formal method of establishing what the customers for the network expect. We work right through to the human-resource motivation end, to make sure our people are properly recognized and motivated. We score in each of these areas. I've never met an organization yet that didn't think they were really doing extremely well. You've got to somehow break through this to show how network management is really being done, and

Vendors should provide end-to-end network offerings that are transaction-based, reliable, and capable of competently managing data and promoting data security and integrity.

—Mark Teflian

Pick one thing you want in transaction processing:

1. Fault-tolerant
2. Distributed
3. Integrated

In the 1990s it would be nice for us to invest in applications with vendors, as France Telecom has done with about 28 companies to stimulate services on ISDN.

—*David Friedman*

then give everybody a chance—not by accusing them of doing poorly, but by showing them how—to improve the way they manage the network.

Keen: A quality program brings you right back to the issue of what our customers expect from the network. Organizational skills in network management may turn out to be a major source of competitive edge. Everybody is going to have the same business demands. In the end, it's going to be quality of service that actually establishes that advantage.

Teflian: I think that's exactly right. We found that some of our own support channels little understood the direct relation between customer satisfaction and the network. Also, the senior management of some telecommunications companies hardly understand that linkage. They tend to see the actual end product as the end business application and not customer satisfaction.

What Vendors Can Do

Keen: I'd like to talk more specifically about the vendors. What can vendors do that will make a real change? And what can customers do to help them? David?

Binko: I think that vendors should really get out of the product focus and more into a consultancy focus. There are at least six components of network management, at least four of which don't come off a reel of tape. Vendors like Digital, AT&T and IBM manage some of the largest corporate networks in the world; it would help if they could make their experience available in some form.

Keen: From the vendors' view, how can customers help you? Do you need more information from customers?

Friedman: We would like to get involved with customers as they consider their long-term strategic focus. We're working with companies such as Motorola on enterprise modeling and getting involved in applying technology to solve the business problems. We have set up "business forums" of customers in each state. They serve as boards of directors, telling us if we're going in the right direction to meet needs two to five years down the road. We're integrating this into our account-management process. We're trying to change from the technology focus of the past to a customer focus. We've taken action to educate our people from the senior level on down on what it means to be "customer focused"—to not just send out a product and sell it, but understand what the market needs. And we're hiring people from specific industries to help us understand the business problems those industries face.

Binko: I certainly expect technology is going to move faster in the '90s than in the '80s, but we, as information technology executives, are going to absorb it more selectively. Many of the information technology products we are buying are going to become commodities. The vendors that can add value through their consultancy by being open with their experiences are going to be the vendors to whom I'll give my precious dollars. Nobody says this has to come for free. I throw it back to the vendors to find some creative means by which these services can be packaged as part of their offerings.

Keen: Howard, is this linked to what you were saying about how both users and vendors have been in a process of mutual reaction?

Vendors should standardize on hardware and software. We would like to be able to have people all over the world, irrespective of the name on the box, to communicate without putting so much technology in the center.

—*Leonard Cohn*

Frank: It's not only linked, it's a direct consequence of it. Let me give you a very specific example. Some time ago, we looked at a several-billion-dollar corporation and what they needed in order to do a better job of managing their network. From our product point of view, they needed to put in $100,000 worth of software. That would have been no problem whatsoever. But what they really needed to do was spend a million dollars on overhauling their procedures, getting up internal databases, etc. They were afraid to go off and ask for internal resources; they weren't budgeted, they weren't perceived as being necessary, and they just didn't have that process in house.

Vendors of major systems have been really selling products. There are lots of systems around, but there's really been no one who is selling a long-term concept and putting all this together.

Barrett: I disagree with Howard. Vendors *are* offering concepts. But I want them to be more clear on what is a concept and what is a product. I spend too much time clarifying strategic directions and trying to figure out realistic time lines for deliverable products. Sometimes vendors offer too much concept. CIO

Peter Keen is executive director of the International Center for Information Technologies (ICIT) in Washington. ICIT conducts research on business technology issues at the behest of corporate clients and conducts education programs and creates business television for senior management. Keen is the author of Decision Support Systems *and* Competing in Time. *A new book,* Shaping the Future: Business Design Through Information Technology, *will be published in the fall. Keen has taught at Harvard, MIT and Stanford and is a visiting lecturer at Fordham University in New York.*

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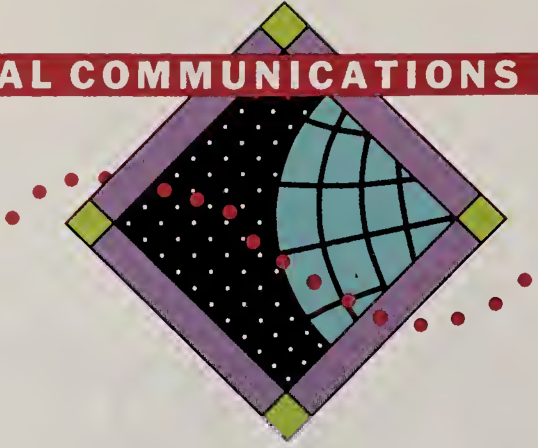

ECONOMICS

Is It Soup Yet?

Choosing the right ingredients for a telecom infrastructure
means carefully measuring goals, resources,
risks and realities

BY SCOTT WALLACE
& MICKEY WILLIAMSON

A couple of years ago, one of the major telecommunications vendors ran a series of television commercials that all seemed to feature the poor sap who chose the wrong corporate telecom solution and is being publicly humiliated before, presumably, being sucked through a trapdoor into career hell.

The stakes may or may not be quite so lurid, but choosing a corporate telecommunications strategy is one of the most high-impact, high-visibility decisions a CIO can make. It's not a simple selection either. In an environment of shifting demand and technological change, the telecommunications manager is called upon to provide an often unspecified level of performance within a well-defined budget. Selecting the mix of products and services that will best support an organization's needs is first and foremost an exercise in planning.

ILLUSTRATION BY CHRIS GALL

One trick to successful telecommunications planning is to take the initiative, not just react to events. "Most companies are not doing step-by-step planning," said Richard Villers, manager of computer networking strategies for International Data Corp. in Framingham, Mass. "They're just going from one crisis to the next, with no organized approach."

A solid understanding of enterprise goals, infrastructure and procedures is vital, according to Carl Pitasi, vice president and director of enterprise network strategy services at the Gartner Group, a Stamford, Conn., research firm. "Go from your user toward your resources, not the other way around. Otherwise the network ends up serving the resources instead of serving the user."

A careful review of corporate telecommunications needs may be indistinguishable from a corporatewide strategic planning effort. "Look at the strategic direction of the company," said Michael P. Setteducato, senior vice president and co-founder at systems integrator Wye Technologies Inc. in Annapolis, Md. "Examine the costs associated with delivering products to the market. If they are heavily weighted with IS and telecommunications costs and it's a highly competitive situation, then it's probably advisable to do the planning."

Once the business is clearly understood and the services that support it are identified, then the problem remaining is to select a strategy. This strategy will be modeled on the business and will dictate whether an organization should buy off-the-shelf telecommunications products, build its system in-house, contract out for telecommunications services or use a combination of all three options. Making this decision has never been more complex, but there have never been more resources available to support the task.

One often-overlooked resource is the vendors. Experts in the telecommunications industry agree that the relationship between vendors and users is changing. Rapidly evolving technology, shifting customer requirements, diversity and complexity of vendor offerings, and the rise of carrier competition have all contributed to transform telecommunications product-marketing from a black-box type of sale to a consultative one.

Jerry Gossman, director of information processing for McDonald's Corp. in Oak Brook, Ill., described how the telecommunications planning process at McDonald's works. "We tend to use our vendors more in a consulting role," said Gossman. "We

The trend is toward more competitive pricing, faster transmission speeds and greater flexibility. Though the basic cost of communications is decreasing, industry experts agree that increased use and additional services will consume the savings.

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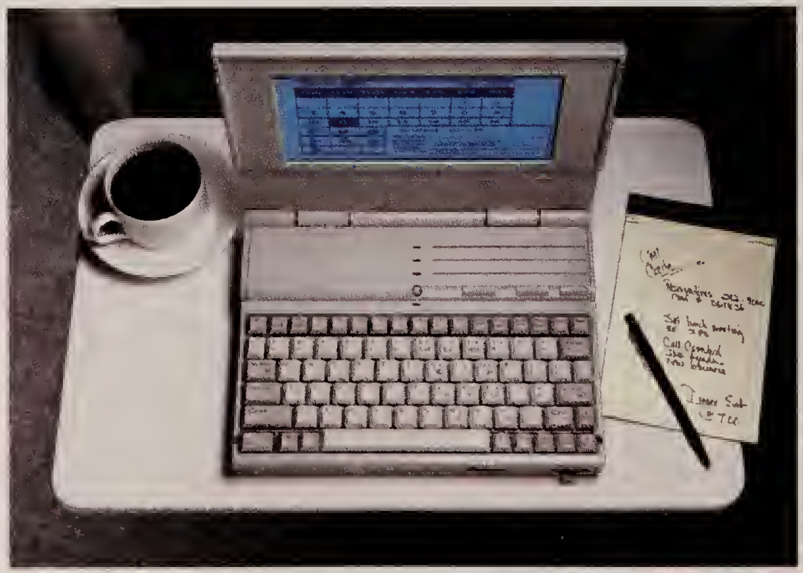

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MICHAEL P. SETTEDUCATO: *Review telecom needs in the context of corporate goals.*

PHOTO BY WALTER P. CALAHAN

put out a Request for Information and set out several different architectures as we see telecommunications evolving. We ask the vendors how they would modify things and how their products and services would fit into each of the architectures. From that perspective, we're using our vendors to be sure that we're looking at the best available architectures, which leads to design and then to costs."

> "**Most companies are not doing step-by-step planning. They're just going from one crisis to the next, with no organized approach."**
>
> *–Richard Villers*

Gossman finds real value in this relationship, and so do his suppliers. "The vendors would like to see us use them even more, where they would not only [have] input on architectures but do the design and provide the service [as well]. We haven't bought into that yet as the most viable solution. What we will try to do is keep things hybrid." For McDonald's, "hybrid" means mixing in-house with contract expertise and using multiple vendors for contracted services.

The multivendor approach is a practical solution for Gossman. "Our belief at the moment—and it can change from moment to moment—is that it makes sense to keep the vendors competitive. If someone comes up with an architecture that just knocks our socks off, and we know that it really makes sense for the next five years, then we would look into that very seriously. On the other hand, if no one can do that, then we may be better off going multivendor simply because no one has the right answer yet."

Sometimes the nature of an enterprise closes off many options. Consider the telecommunications network of the Peabody Holding Co. Inc., owners and operators of coal mining operations throughout the United States. Richard Price, vice president of information services at the St. Louis-based company, has not embraced a multivendor philosophy. "I've not been so concerned about having multiple suppliers in the network as I am in providing route diversity. And since the places you put coal mines are not typically large cities, we may be in a circumstance where there is only one provider."

Price does not look outside his organization for product or design expertise. "We have not used consultants on the network side for the 10 years that I've been here," he said. "Network design, with submission to AT&T for affirmation and verification of pathing and routing, has all been done internally."

Using vendors as consultants will probably get you the best of the currently available offerings, but it may hold you back in terms of long-range technology planning, observed Price. "Many vendors' products are replaced on a four-year cycle, by either planned obsolescence or simple evolution of product."

This may suggest a bleak future, but the trend is toward lower prices, faster transmission speeds and greater flexibility. Though the basic cost of communications is decreasing, industry experts agree that increased use and additional services will consume the savings.

One technological innovation that is driving costs down and usage up is the software-defined network, or SDN.

> **"In the next five years, we can expect to see the emergence of protocol-independent virtual public data networks that can compete economically with most private data networks. That's a big deal. It implies very broad connectivity with much lower unit costs."**
>
> *–Carl Pitasi*

AT&T, MCI and US Sprint each offers an SDN, also known as a virtual private network. Such networks provide common-carrier users with features and price previously found only on private networks. Increased flexibility, manageability and savings are available without the need for a user to implement, modify or maintain private lines or switches, responsibilities that fall to the vendor.

Even for the company that relies upon private lines, SDNs are likely to be an integral part of new network strategies. They support the incremental addition of bandwidth and can offer sophisticated network-management and support tools. SDNs offer public network access to companies wanting to add route redundancy and diversity to their private networks. A few well-publicized failures of major common-carrier links have shown the importance of having more than one telecommunications pathway.

Additional flexibility, said Pitasi, will come with the advent of virtual public data networks that companies can connect to regardless of what vendor's equipment they are using. A virtual public network is a software-defined segment of the carrier's system that functions for the user like a closed, private network. It differs from a virtual private network by being accessible on an as-needed basis by any user company without contractual pre-arrangement. "In the next five years," he said, "we can expect to see the emergence of protocol-independent virtual public data networks that can compete economically with most private data networks. That's a big deal. It implies very broad connectivity with much lower unit costs."

The same network-management capabilities that support software-defined or virtual private networks enable a carrier to reconfigure networks and services dynamically. One early derivative is the unbundling of T-carrier services, which support high-volume transmissions between two points. T1 services, for instance, support a digital signal at 1.544 million bits per second (Mbps), which is the equivalent of 24 voice channels. Previously, while a business may have needed a fraction of a T1 line, dedicated lines were the only available service.

Fractional T-carrier service provides the same digital capabilities that have been available on leased lines, but instead of 24-hour-a-day access and charge, access is more flexible and charges are based on usage. Fractional services also allow a user to lease less than the full bandwidth of the channel.

End-user employment of T-carrier services is a precursor to widespread implementation of integrated services digital networks, or ISDN. An increase in the use of ISDN networks will be supported by higher-speed communications. The digital T-carrier services (T2, T3, and T4, rated at 6.312 Mbps, 44 Mbps and 274.176

JERRY GOSSMAN: *Vendors are an oft-overlooked consulting resource for users.*

PHOTO BY NEIL MACDONALD

Mbps, respectively) have traditionally been specialized services on dedicated lines, but they are migrating toward synchronous optical networks, or SONET.

Offered in basic building blocks of 50 Mbps, SONET will allow a user to construct a single bitstream of up to 13 billion bits in bandwidth. Given the business trends toward distributed processing, larger file transmissions and computer imaging, SONET offerings could well become a common backbone element in larger and higher-speed networks. For high-speed LANs such as the 100 Mbps FDDI (fiber distributed data interface), SONET services offer public carrier connection of widely distanced LANs at native LAN speeds.

Another means of connecting widely separated points is using satellite transmission, through very small aperture terminals (VSATs). Costs of satellite communications, unlike those of terrestrial circuits, are not distance-sensitive. As a result, VSATs are popular in applications where services must be delivered to remote locations or for point-to-multi-point transmissions. Some companies, such as J.C. Penney Co., also use VSATs to back up their terrestrial networks.

In general, although the costs of computers and network hardware are going down, the price of hooking up to the network is rising. This results in part from managing a network that includes products from diverse vendors and, hence, incorporates multiple communications protocols.

Mergers and acquisitions often leave CIOs with no choice but to plan their networks around equipment from a variety of vendors. Other organizations choose multiple vendors to provide added flexibility. But change doesn't usually come easily in these hybrid environments.

McDonald's Gossman commented: "Using AT&T MegaCom and then going to SDN [AT&T's virtual private network] is pretty seamless. Since it's all done in the switches at AT&T, it's really a billing issue. You don't see any change." However, McDonald's converted from AT&T

The Meaning of Life Span

Some want systems to live fast and die young.
Others hope they will ripen like wine.
What you think of system longevity depends
on what you're doing with it.

Although the prices of telecommunications products are coming down across the board, the useful life of these systems varies widely from installation to installation. Some companies' search for ever-greater responsiveness leads them to snatch up product upgrades as they come out vendors' doors. For companies whose networks do not play a strategic role, however, cost takes precedence over performance and speed.

At the Salomon Brothers brokerage firm in New York, where a single electronic transaction may be worth tens of millions of dollars, a tenth of a second can make a difference in whether a trade takes place or not. With stakes as high as these, CIO Fran Dramis wants the fastest and best technology supporting his network. A long life span is something he can afford to do without.

FRAN DRAMIS *can live without long life spans.*

"Product life spans for leading-edge customers are coming way down," Dramis commented. "If I look at the elements of my telecommunications system, I'll see varying life spans." For Dramis, cable has a 10 to 15 year life, but the routers connected into the fiber optics and the black boxes that support protocol conversion among products from different vendors are good for only two or three years.

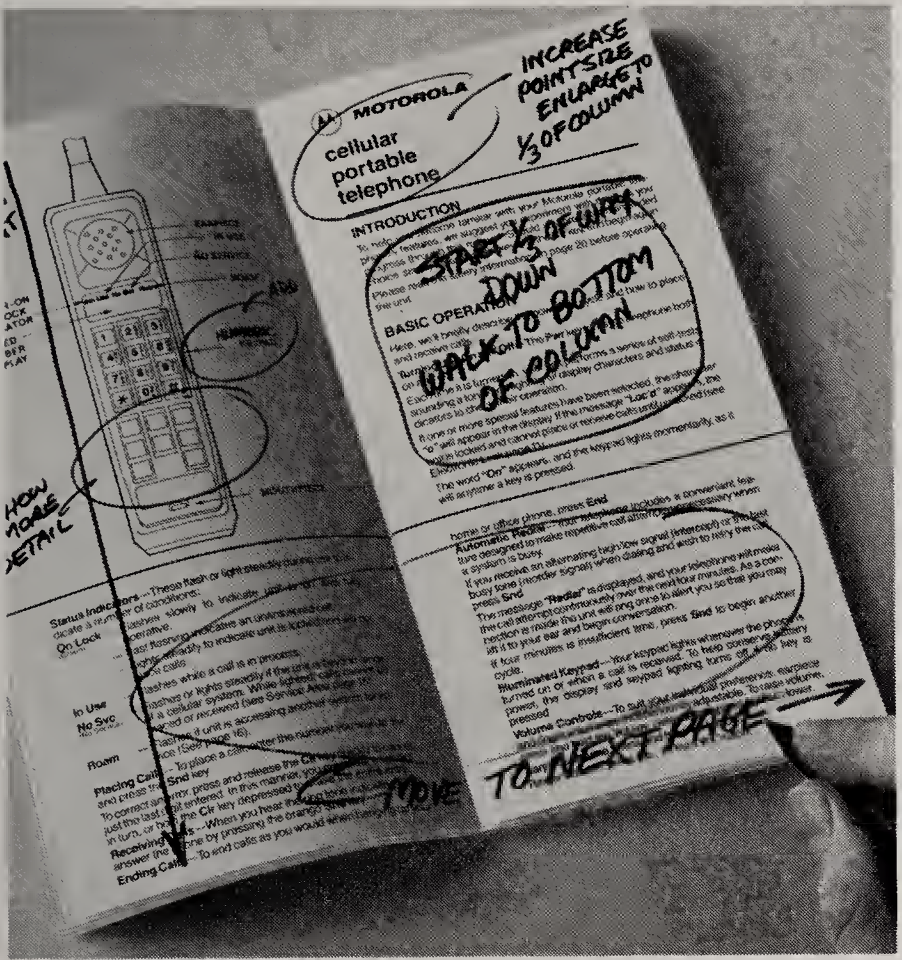
"For big pipes—T1s—I'm really looking at two years," Dramis continued. "If you consider the software that manages the process, I'd bring it down to less than a year. There's such a dearth of telecommunications management software that anything we get would probably be improved in a very short period of time."

At Salomon Brothers, the slightest improvements in network performance can have value far exceeding their cost. "There really isn't an issue in our business of saying, 'Is this strategic or not?' because everything we do is strategic." At J.C. Penney in Dallas, network traffic is less strategic, and network management is not driven by the need to deliver every possible ounce of performance. "Managing bandwidth every hour of the day isn't practical for us," said Al Ladwig, Penney's communications manager. "I'd be spending more money than it's worth."

Even so, with equipment conditions changing so rapidly, the ability to think flexibly is a must. "Change is a way of life," Ladwig said. "We're constantly changing portions of our network. Right now I'm seeing a tremendous surge in demand. The price of telecom services is coming down at such a rate that I'd expect to be able to expand the amount of connectivity to my major sites and get it at the same price that I'm paying today."

—M. Williamson & S. Wallace

PHOTO BY JOSEPH BERGER



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RICHARD PRICE: *a decade of maintaining network planning and design as an in-house operation*

PHOTO BY RICK STANKOVEN

point-to-point leased lines to fractional T1 with Sprint. That kind of change, Gossman said, "is a lot more evident to the user. You're installing different equipment, and [the user is] being trained on a completely different set of issues. It's not seamless, by any stretch of the imagination, if you change vendors or technology."

Taken together, the practical realities of hybrid networks and the scarcity of experienced people to run them make network management especially challenging. An option some CIOs find attractive is to hire a third party to take responsibility for telecommunications. Such outsourcing arrangements differ from systems-integration or consulting relationships in that the third party is responsible not only for providing a service, but also for maintaining the environment needed to support that service.

Outsourcing offers a new type of cooperative relationship between vendor and customer based upon a rapidly changing technological environment, rising labor costs, lack of established standards, and the belief that proprietary solutions are more expensive and less serviceable than hybrid solutions.

Some experts question the wisdom of trusting the network to an outsider. "If [the network is] really key and strategic," said Les Sitzes, product manager of Datapro Research, a market-research and publishing firm in Delran, N.J., "then I'd have serious questions about outsourcing. A company . . . may want to outsource certain components or elements of their DP operation while still maintaining network control."

> **"To the best of our knowledge, outsourcing companies are only providing you with one guarantee: They'll send you a bill every month."**
>
> *—Carl Pitasi*

In order to determine the benefits of outsourcing, according to Pitasi, "you have to quantify the performance of the organization to compare against promised performance. As to promises, to the best of our knowledge, outsourcing companies are only providing you with one guarantee: They'll send you a bill every month. We tell our clients: 'Don't sign long-term outsourcing contracts.'"

Pitasi offered some final words of advice. "Before you outsource, remember this: You have to keep good talent in-house or you'll never know what these guys are doing for you. You must have competent staff, whether you buy, rent or build." CIO

Scott Wallace is a member of the Qwerty Group, technical journalists based in Warwick, Mass. Mickey Williamson heads the Qwerty Group and edits the newsletter CASE Strategies.

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ECONOMICS PROFILE

Greasing the Wheels

Citicorp's node-and-spoke network has benefited from both hot technology and cool management control

BY PAUL KONSTADT

David Starr stared out the airplane window in frustration. Planes of every shape and size stood between the Citicorp executive's aircraft and the runway. The whine of countless idling jets pierced the cabin walls, punctuated every so often by the shattering roar of engines at full throttle. It was a scene repeated daily at major airports across the country, and no less hellish for being so utterly commonplace.

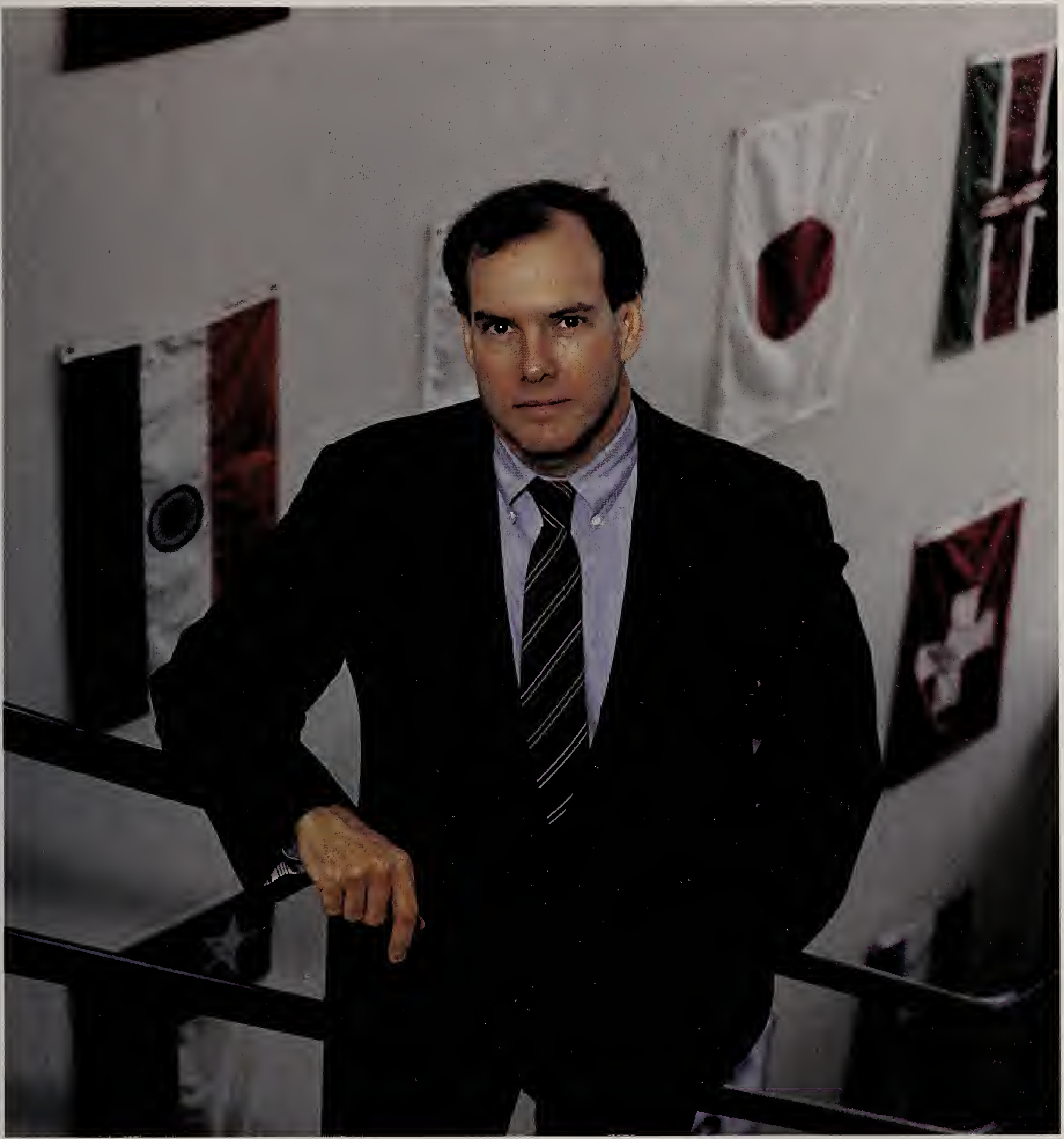
"Why am I passing through Newark?" Starr wondered. "Because a system of feeder routes concentrating passengers at designated hub airports is more efficient for the carriers," he reminded himself automatically—then sat up with a start. "I can do the same thing with my network!"

Starr, senior vice president for information technology at Citicorp Global Payment Products in Tampa, Fla., had recently been hired away from his consultant's position at Price Waterhouse, and one of his key assignments was to improve the efficiency of the worldwide computer network used by that business unit of the banking giant.

"We're the organization that supports traveler's checks for Citicorp," he said. "If you lose your [Citicorp] traveler's check anywhere in the world, this is where you call into."

The system created for the traveler's check operation brings voice and data into Tampa from 92 countries in Europe, the Pacific, and Central and South America. It uses a combination of local telephone connections, satellite channels, Citicorp's corporate network, and proprietary hookups run by IBM Corp., AT&T and MCI Communications Corp. Voice and data are fully integrated in the United States but still handled separately in much of the rest of the world, and the entire complex plays a central role in Citicorp's competitive strategy.

"The main thing is service," Starr said. "When you are stuck in Norway in a storm, all you care about is whether you get



DAVID STARR: *At Citicorp, where customer service is "the main thing," network reliability is crucial.*

through to replace your lost checks." While there previously had been a clear strategic imperative to use advanced information technology as a competitive tool, there was little practical orchestration of information and communications needs until Starr came.

"There was chaos," he recalled. "We were in a competitive situation, trying desperately to overrun American Express, . . . and it was expensive." Starr now points proudly to the 25 percent reduction in network costs per minute he's achieved in the past four years and says that realizing those savings while preserving the benefits of the network required technological innovation and managerial improvements.

The key internally created breakthrough was the node-and-spoke architecture—local phone lines funneling low-density traffic from clusters of sites to equipment that can concentrate that flow into streams, then send it over high-density transcontinental or transoceanic links to data centers in Tampa or Buffalo, N.Y.

"We were looking for ways to cut

PHOTOS BY MICHAEL MINARDI

Compared to HP's NewWave Office, IBM's

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down international traffic into local calls, then transmit it in bursts," Starr said. "[Now] we can automatically rewrite the routes as needed [in order] to respond to traffic changes."

The architecture has allowed Citicorp to reduce the number of intercontinental links it needs and to maximize its use of larger-bandwidth channels—those that also have the lowest cost per unit. The spoke-and-node system allows Citicorp to minimize the tariffs it is assessed for transborder data flow by sending its messages along the least-taxed routes and changing its local connections as the tax consequences change. "Sometimes we use a real circuitous route," Starr said.

> **"One good guy can pay for his salary getting vendors to compete against each other. He knows which tires to kick. It's really just managing the vendors."**
>
> *—David Starr*

In many cases, geography helped dictate technological choice. In Europe and Asia, Citicorp could rely extensively on utilities and other providers of wired networks, but in Latin America they had to make wide use of satellite relay equipment. "The telephone system there is a part-time activity," said Starr. "It's not of a grade that we can send data over."

Market changes like the advent of fractional T1 have also had a substantial impact on Citicorp's network. T1 is the industry shorthand for a computer-to-computer link capable of carrying 1.544 million bits of data per second. Its capacity is equivalent to 24 of the older 64,000-bit connections at the price of only four or five of them. Fractional T1 is the practice of selling access to those high-density lines in 64,000-bit chunks at close to the T1 unit price, which amounts to a 60 percent to 80 percent cut from the old separate 64,000-bit-line cost.

"It was a windfall," Starr said. "It cut costs by an order of magnitude."

Fractional T1 also allowed Citicorp to create more direct links between its offices and data centers, closing down some nodes in the process. "Technology seems to be advancing faster, [and] pricing is becoming much more competitive as companies become more mature," Starr said. Because of such developments, he added, "telecommunications costs are coming down faster than hardware."

While there are as yet no practical ways to increase the velocity of electronic signals, Starr noted that there have been "some actual technological breakthroughs; . . . among them . . . clever ways to compress and encode data" so that each unit of network capacity can carry more information now than it could in the past. These, too, helped Citicorp cut costs and boost network efficiency.

Perhaps even more than technological or marketing improvements, Starr's focus on conventional managerial control had a significant impact on Citicorp's bottom line. The biggest single component of Starr's cost savings, in fact, came from simply auditing the bills Citicorp received from its communications suppliers and paying only for the services actually used.

"When I saw how big [the errors were], I was astounded," Starr recalled. "We had always treated paying the bills as something of a clerical activity, and that left a lot of room for problems." In addition, when it came to specific choices on lines, technology and networks, "we were just doing what the phone company had told us to do. When they said put in another line, we just did it. . . . We were intimidated by our suppliers."

Starr's immediate solution to the invoice-management problem was to hire a consulting firm specializing in telecommunications bill audits. They took no up-front fee, but instead asked for a percentage of any savings they realized for Citicorp. "They made money on us," Starr said.

While the commissioned error-hunters were useful, Starr thought that the ultimate solution would be to add the necessary expertise to his management team.

"One good guy can pay for his salary [by] getting vendors to compete against each other . . . ," Starr said. "He knows which tires to kick. It's really just managing the vendors."

While "proper management" is an almost clichéd prescription for the ills brought on by rapid technological change, it is also the most effective medicine—if the managerial expertise can be found. "The problem is that the stuff is so arcane," Starr said. "There isn't even a college curriculum, it changes so fast. . . . In fact, the best director working for me hasn't even been to college."

That means that the biggest reservoir of potential telecommunications managers lies among the men and women already working in the field. "Piracy was probably my major management breakthrough," Starr said with just a hint of humor.

Starr's experiences with building a rational network and a seasoned management team to run it have taught him that "telecommunications isn't something you take for granted." He suggests that neophytes should begin by purchasing their network services from established vendors like ADP and IBM.

"There are some very good networks out there," and it is much less risky to start out by using one of them to provide the link-ups, he said. Once the system is up and running, managers can start looking to "break off pieces and bring them in house," where it is possible to save money and customize service with the right expertise.

But, he warned, even the best information executives "can get into a lot of trouble immediately. Telecommunications is a different kind of technology than computers and programming." CIO

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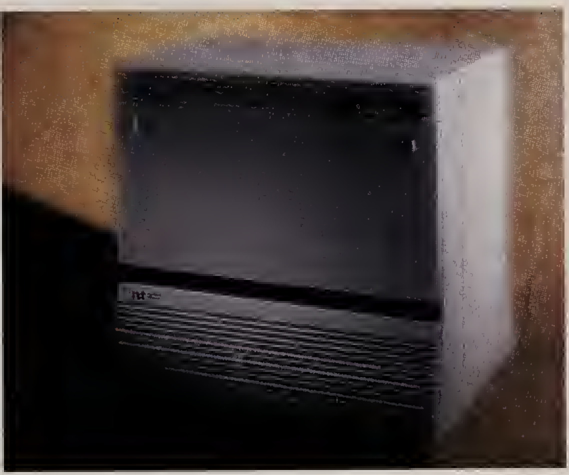

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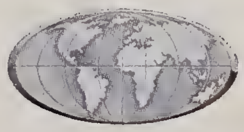

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MANAGEMENT

Dealing The Wild Card

Getting a handle on networks may call for a management restructuring within information technology. And that's just for starters

BY DAVID FREEDMAN

Donald Melvin's office is filled with balloons. After 15 years with Intel Corp. in Santa Clara, Calif., most recently as telecommunications senior strategist, Melvin is retiring. Actually, it's more like semi-retirement: Intel is counting on Melvin's consulting services to help grow and maintain the state-of-the-art, fast-packet-switched, ISDN-based global network of which he directed the planning, design and implementation. No wonder the company has given him all those balloons.

Most large companies would kill for a Donald Melvin these days. Networks have become the wild card in organizations' struggle to transform costly and sprawling conglomerations of workstations and data centers into smooth-running engines for productivity and competitive strategies. "The CIO doesn't run data centers anymore," said Stanley L. Kroder, director of the

ILLUSTRATION BY LINDA BLECK

telecommunications management program at the University of Dallas business school in Irving, Texas. "He has to provide the lifelines between the data centers and end users. The whole company is becoming increasingly dependent on the network."

But there are a host of obstacles and uncertainties confronting the CIO determined to position his or her company's network for the 21st century—not to mention the next few years. Among them: the inappropriateness of existing management and organizational structures for dealing with the growing importance of networks; the shortage of highly experienced people like Donald Melvin to translate business requirements into network specifications; and a profusion of incompatible technologies and conflicting standards that make integration difficult and investments risky.

For those who can navigate these roiling waters, the rewards promise to be substantial. "In the past, telecommunications was more of a cost-containment activity that had a large downside but little upside," noted Gerald Mayfield, a consultant with the DMW Group Inc., a telecommunications consulting firm in Stamford, Conn. "But now that there is real competition in carrier services and telecommunications is tying into corporate strategies, we're suddenly talking about a huge potential contribution to the bottom line."

Reaping these rewards may require significant changes within the IS department. "Cooperative processing is changing the style of computing, and organizational structure has to evolve to reflect these changes," said Howard Niden, a senior manager with management consulting and accounting firm Price Waterhouse in Pittsburgh. "With networks becoming an integral part of the computing environment, I see the situations that networks and systems management address becoming blurred at certain levels. The organization that treats these two entities separately at all levels will end up coming at the same problem from different directions.

That can be resource wasteful, if not counterproductive."

The problem, said Niden, is that organizations have typically tried to keep telecommunications and information technology separate at the operations level. That makes it difficult to implement systems efficiently and to troubleshoot problems and assess software quality, since network glitches can look like software errors, and vice versa. Some of his clients, he pointed out, have mistakenly come close to abandoning major software packages because they failed to recognize the network problems that underlay their poor performance.

What's needed, Niden claims, is an all-encompassing operations group that includes a number of people trained in both telecommunications and systems. Unfortunately, such bi-technical experts are currently hard to find. "Most people in the organization today have grown up as specialists in one area or the other, and cross-training may not be the most efficient use of their expertise. But as the network and systems operations groups merge, companies should be looking at bringing in new people that can be cross-trained from the beginning. It's a big change, and it will be slow in coming."

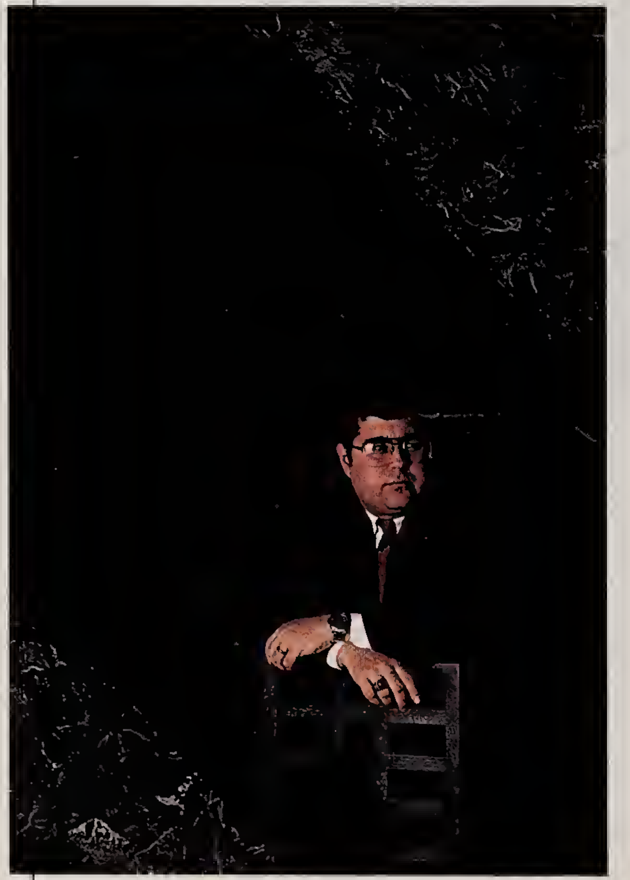
HOWARD NIDEN: *strength in unity*

PHOTO BY MARK BOLSTER

DONALD MELVIN: *A Joe Montana of the telecom world can avoid being tackled by details.*

PHOTO BY DAVID POWERS

At the planning level, Niden said, application software development should take place outside the context of network development. "Information systems developers are better off not caring about whether their applications will be distributed," he said. "They should design the functional portions of the applications and let the operations people make the decisions about implementation and network design."

This idea of splitting the technology function into applications development and operations rather than information systems and telecommunications seems to be finding its way into a growing number of large organizations. At chemical manufacturer ICI

Squeaky Wheels

Consistent pressure helps assure vendor responsiveness

One of the key roles that a telecommunications strategist must play, according to Donald Melvin, former telecommunications senior strategist at Intel Corp. in Santa Clara, Calif., is that of a wielder of influence among vendors and standards bodies. If that doesn't happen, he said, telecommunications managers will be fighting a losing battle to keep up with the rapid rate of change.

To aid in this struggle at Intel, Melvin established an in-house telecommunications development lab for evaluating new products and technologies. "If there's anything we don't like about a product, we call the vendor in and they tweak it," he said. Thanks to this process, Intel has been able to become one of the first companies to implement on a large scale such innovative technologies as fast-packet switching—which allows large bursts of data to push their way economically through networks—and dial-up, real-time color video teleconferencing integrated with voice and data. Intel is also active in the National ISDN Users' Forum, an influential standards body run by the National

Americas Inc. of Wilmington, Del., for example, there is no organizational distinction between telecommunications and the operations part of information technology. The two functions have been merged together into a "telecommunications and computing services" department that, along with a separate applications-development group, reports to the CIO.

According to John Duffy, director of the new department, it is evolving into a sort of hardware and network "utility" that services both end users and the applications-development department. "We're trying to provide a common, centrally controlled infrastructure," he said. "People here can buy network or computing services from us and just plug into the infrastructure."

In practice, noted Duffy, the key element to being successful as a telecommunications utility is more or less the same as it would be under any other management structure: developing a cost-effective and flexible backbone network. The emphasis at ICI, however, is on the flexibility. "We have to provide solutions that will meet whatever business needs emerge," he explained. "At the end of the day, we're here to support the business, not to optimize the cost of computing."

To make sure his group is on the right track, Duffy has commissioned a team of "account representatives" that works directly with various business units to become familiar with their computing and telecommunications requirements. Duffy contends that this sort of close contact makes his group worth more than the wire it runs. "We're not just trying to provide technical services," he said. "We want to be project managers, consultants, facilitators, negotiators and catalysts."

Also interested in the concept of a telecommunications and computing utility is Darwin John, who recently left the CIO slot at Scott Paper to take over the top IS position at the Church of Jesus Christ of Latter-day Saints in Salt Lake City, Utah. Though one might not normally associate churches with telecommunications issues, the Mormon Church is in fact an information-intensive organization with hundreds of ministries and offices around the world. One of the first things John is examining in his new position is the organization's direction in networks, as well as the management structure most appropriate to that direction.

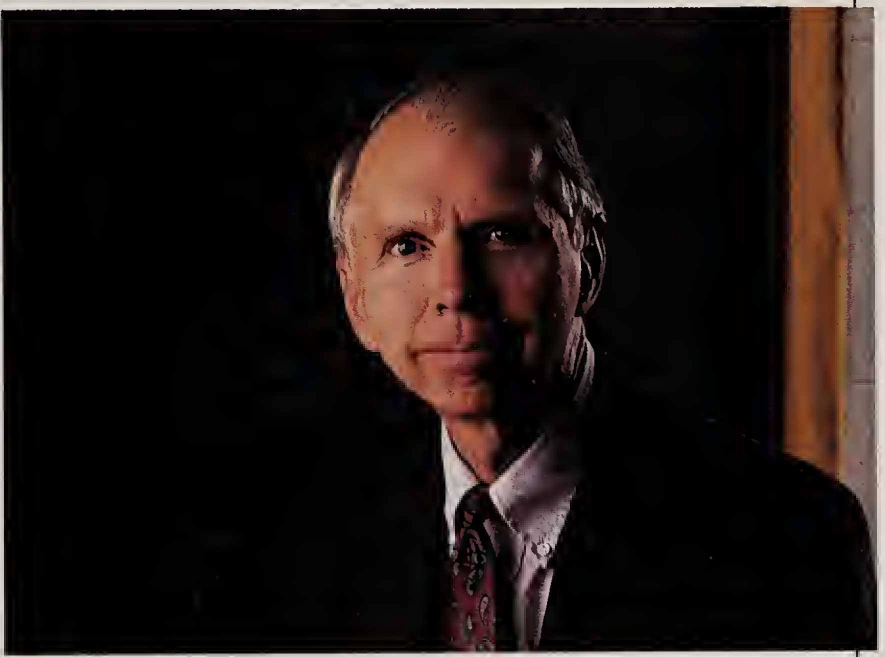
STANLEY L. KRODER: *Friction arising from turf issues slows progress.*

PHOTO BY PETE LACKER

"Right now," he said, "we're organized in the more classical sense, with telecommunications as a separate function and with planning, development and operations all together in a single arena. But my belief is that as we look at our future state, we may end up more focused on the idea of a utility consisting of a combined operations function, with planning done separately."

John maintains that, ultimately, networks must be an integral part of the overall architecture that guides all activities within IS. But, he noted, networks can't be treated as a separate entity that is planned and developed in parallel with everything else; rather, telecommunications development should follow other, more basic aspects of architectural development. "You have to begin with an organizational mission," he said. "[You must] consider the processes that will help realize the mission, then the information needed to support the pro-

Institute of Standards and Technology in Gaithersburg, Md.

Taking an aggressive stance with vendors can help protect against getting stuck with networks that turn out to be unreliable or incompatible with emerging standards, according to David Mengden, director of computing and networking services at E.I. du Pont de Nemours & Co. in Wilmington, Del. "User requirements and expectations have been rising faster than vendors' quality," Mengden complained. "We've been consistent here right up through the CEO in putting pressure on vendors to improve reliability. We've also told them we're not accepting any proprietary networks and that they have to get to open systems as quickly as possible."

Vendors are clearly feeling the pressure. IBM, once brazenly uncooperative with efforts to push industry standards, recently joined the standards body that is shaping OSI. "I would caution people that it will be a long time before you can buy any box and put it on any network," said Helen Morse, manager of network product marketing at IBM. She also noted that, ironically, the more successful organizations are in pushing vendors to provide better networks, the greater is the challenge to use these networks effectively. "Networks can have a drastic effect on businesses now," she said. "As they become more automated, it puts more pressure on management because whatever happens to a network is going to happen faster."

—David Freedman

cesses, then the systems that deliver the information and, finally, the technology needed to run the systems." Telecommunications, he noted, must be developed within the framework of that last step, lest an organization end up with high-powered networks that nobody needs.

> "**Telecommunications is changing now as fast as IT did in the 1960s, and some young Turks are finding themselves stopped cold by old-line MIS attitudes."**
>
> *–Stanley L. Kroder*

Regardless of how telecommunications is fit into the IT management structure, almost everyone seems to agree that talking about splitting the management of voice and data networks is hopelessly passé. "That's yesterday's news," said DuWayne Peterson, executive vice president of operations, systems and telecommunications at Merrill Lynch & Co. in New York. "Given today's digital capabilities and T1 lines, it wouldn't make economic or technological sense to do it any other way."

But even this straightforward move works out better on paper than it sometimes does in practice. "There hasn't been enough integrated voice and data planning," charged the University of Dallas's Kroder. "There's too much friction, because the data people don't want to give up any power, and the voice people have felt kind of lost in this new environment. . . . Putting together a common telecommunications infrastructure is difficult when you have people in these two camps." The solution, said Kroder, is to encourage voice people to cross-train, and to weed out the ones that won't. That could be a grim job; Kroder noted that an informal poll he conducted at a recent conference indicated that fewer than one out of 10 voice communications managers working within IT departments knew anything about IT.

Of course, he said, the real challenge in telecommunications is not a glut of IT-ignorant people but a severe shortage of first-rate people in general—especially those that can take a leading role in developing and implementing telecommunications plans.

"The whole thing typically depends on two or three people in high-level staff positions who can blend technical knowledge with business vision," Kroder said. "Even at the largest companies, you could count the number of pathfinders like this on the fingers of one hand." These people can't be created through training, he said. Like top athletes, they simply emerge and rise to the top under their own talent and motivation. And, also like athletes, if they're not treated exceptionally well they won't stick around. "A lot of these people are paid more than their managers," he said.

JOHN DUFFY: *Selling access to a utility*

PHOTO BY EUGENE MOPSIK

Intel's Melvin is clearly one of the Joe Montanas of the telecommunications world. Where can companies find others like him? "It's hard," said Melvin. "You need someone who's been in the telecommunications business for years—I've been in it my whole life—but you can't just grab someone from a telephone company, because they probably won't have a good long-range sense of what's happening in the industry. If you just throw someone into the middle of all this, they'll be swamped by the details."

Whatever the staffing situation in an organization, ultimately it's the CIO that must take responsibility for the contribution that networks can make—or the havoc they can wreak. In fact, said Kroder, many CIOs may be taking too conservative an approach to networks for their organizations' good. "Information technology managers have gotten used to a slower rate of change," he explained. "Telecommunications is changing now as fast as IT did in the 1960s, and some young turks are finding themselves stopped cold by old-line MIS attitudes."

As an example, Kroder noted that the greatest strategic opportunities for telecommunications these days lie with interorganizational networks, which can hook a company into customers and suppliers. Yet some IT managers, he said, are too worried about potential security problems to open up their networks. "You have to balance concern about network integ-

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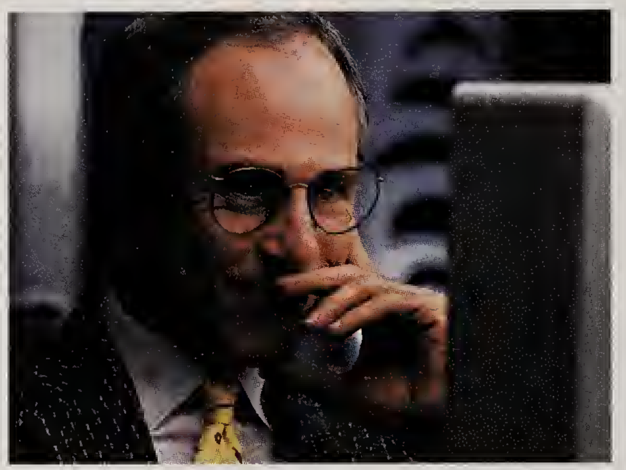

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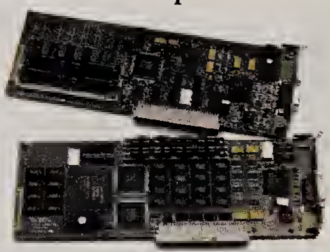

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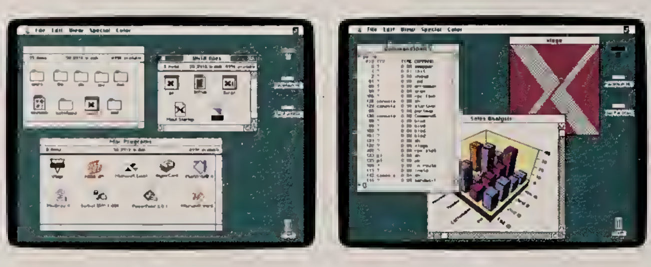

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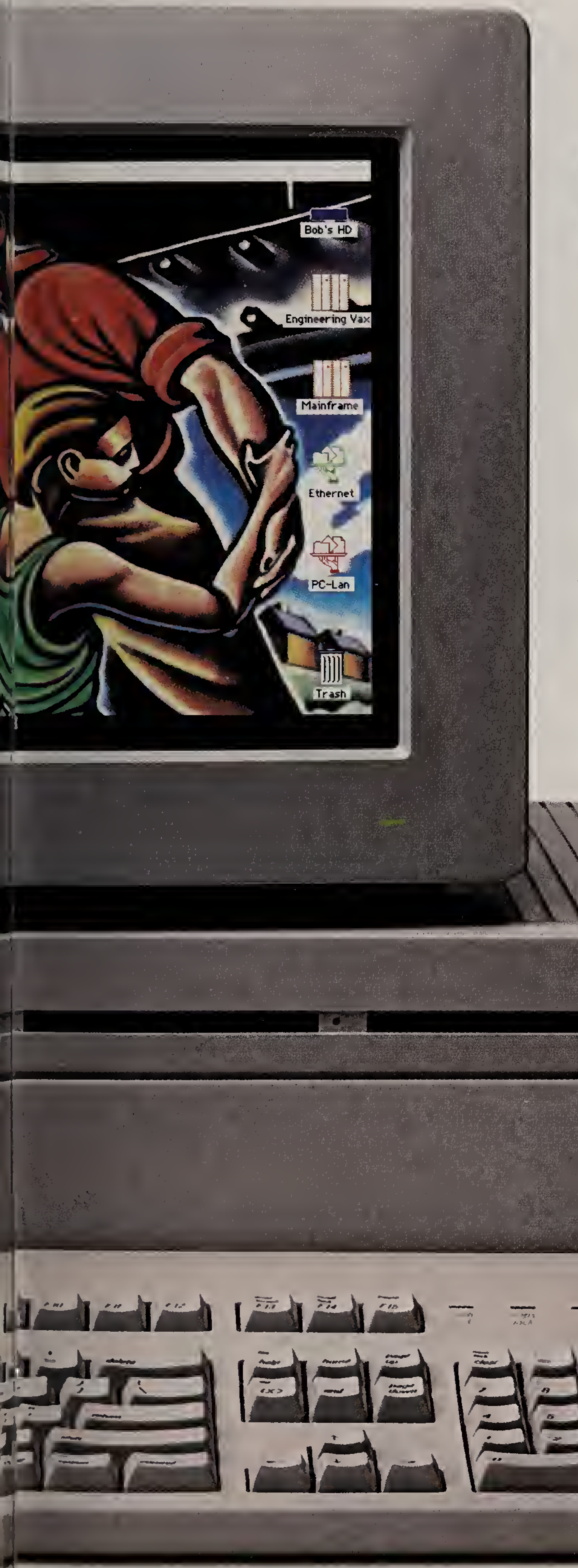

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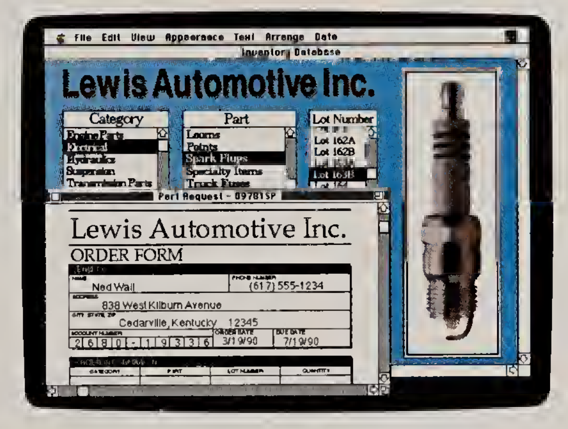

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rity with the need to move ahead strategically," he said. "You can't block all incoming phone calls to your company because one of them might be obscene."

Such overly conservative attitudes on the part of the CIO could be extremely damaging, noted DMW's Mayfield, since the CIO is uniquely qualified to identify and take advantage of strategic telecommunications opportunities. "The tragedy of telecommunications has been the failure of its managers to be able to articulate the opportunities to the board of directors," he said. "The CIO knows how to talk in terms of strategic direction and profit and loss. He can demystify networks for senior management and determine how to reorient strategies—now that we're at the threshold of understanding what the opportunities represent."

But Mayfield would also caution CIOs against leaping overboard in this direction. "The CIO role is a great one for helping senior management become comfortable with telecommunications technology," he said, "but you want to be careful that senior management doesn't become so involved that they start dictating solutions and restricting the latitude of the CIO." Also to be avoided, Mayfield added, is promising too much. "In an environment of unbridled enthusiasm, expectations can go off scale," he said.

The biggest question of all that a CIO must face in telecommunications, according to some, is whether or not the organization should even attempt to build and manage a network on its own. "A CIO that isn't examining network outsourcing isn't fulfilling his or her fiduciary responsibility," said Patrick Springer, director of industry services for Telecommunications Management Consultants in Needham Heights, Mass. "If you are an AT&T or an MCI, then your business is networks. Everybody else is just dabbling. Given the costs of this interesting sideline, CIOs better ask themselves if those funds can't be more productively invested elsewhere."

"A CIO that isn't examining network outsourcing isn't fulfilling his or her fiduciary responsibility."

–Patrick Springer

DARWIN JOHN: *telecommunications as part of a mission-driven architecture*

PHOTO BY DIRK DOUGLAS

David Mengden, director of the computing and networking services division at chemicals giant E.I. du Pont de Nemours & Co. in Wilmington, agrees. "Outsourcing has to be looked at very carefully," he said. "To attract good senior technical people, you have to have a relatively large organization. Even many Fortune 500 companies simply can't achieve the critical mass needed to bring in the right people, and those companies ought to outsource."

While Merrill Lynch has outsourced much of its network, noted Peterson, management must carefully consider which pieces of network operation and management are best retained in-house. "You want to keep control of the brains of the whole thing, to make sure that decisions are being made in your interests and not the interests of the vendor," he said. "We've outsourced the communications lines themselves and retained network planning and management, which we think are the real value-added aspects of telecommunications. Of course, you could debate until you're blue in the face what's essential and what's a commodity."

One thing seems certain: Whatever decision is made today about any aspect of networks, it will have to be re-examined tomorrow in the light of new technologies and business trends.

But that's OK, insists the Mormon Church's Darwin John; not only is the fast pace of change within telecommunications manageable, but it is actually desirable. "Dealing with a stable industry would be preferable if we lived in a perfect world where other variables weren't so dynamic," he said. "But given the way things are, would we really want the technological breakthroughs and improvements to stop? We have to be willing to deal with a certain level of chaos in order to realize the goals we set out to achieve." CIO

David Freedman is a freelance writer based in Brookline, Mass.

IBM MANUFACTURING SOLUTIONS

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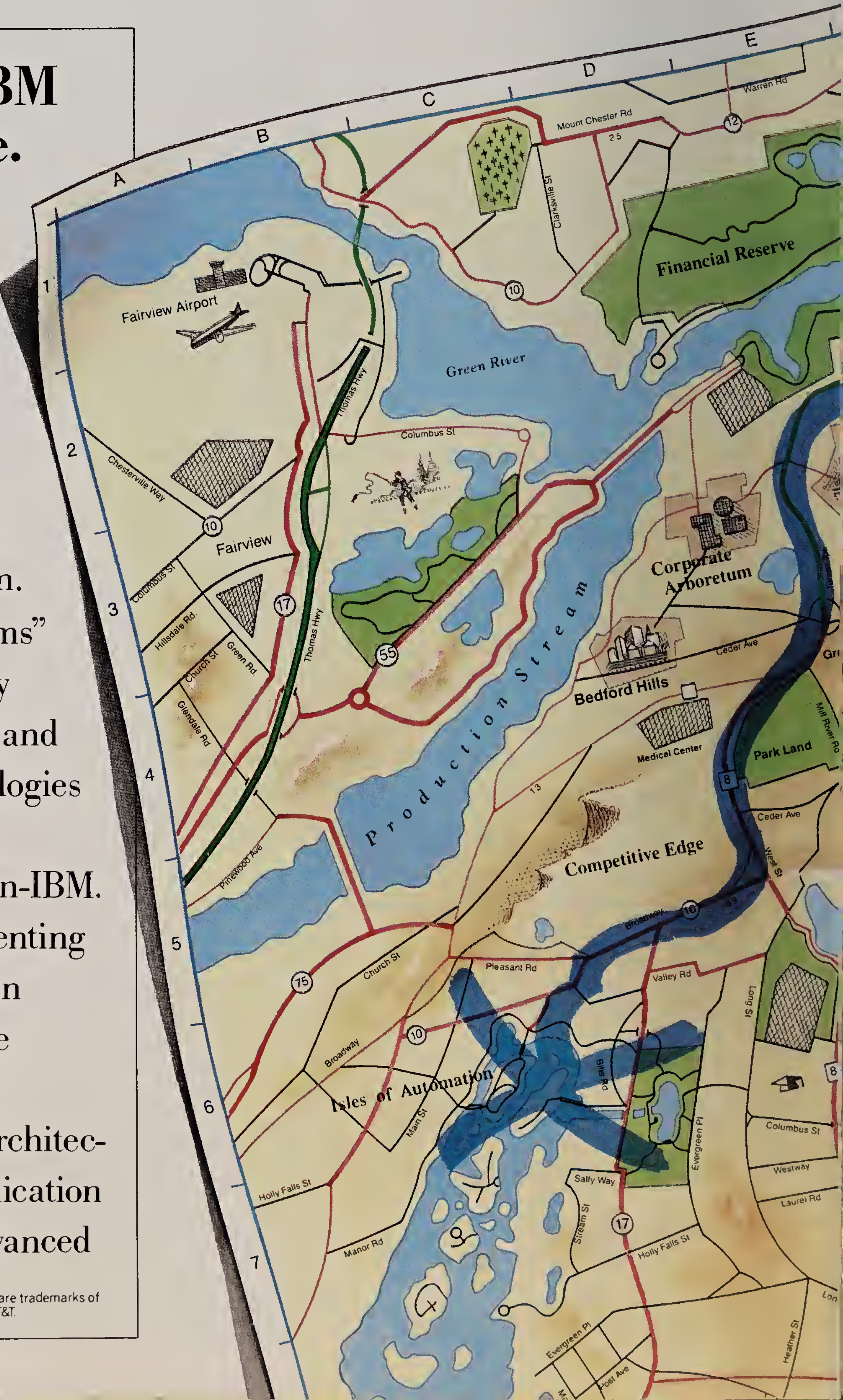

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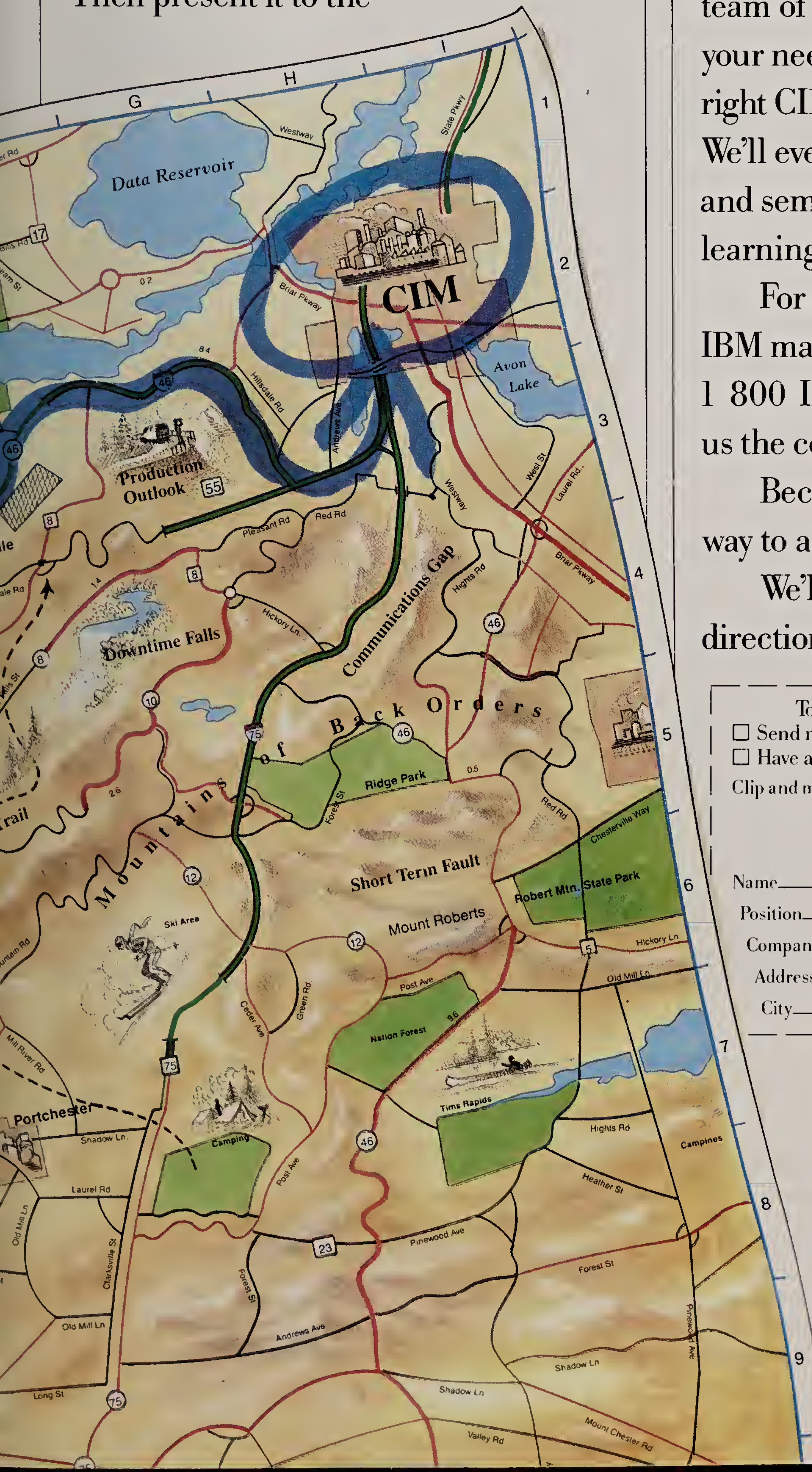

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MANAGEMENT PROFILE

Matching a Pair

Today's CIO faces the daunting challenge
of splicing IS and telecom
into a solid team

BY PAUL KONSTADT

They lived in two different worlds until the shotgun of technology forced them to mix. Now, especially in progressive corporate hierarchies, IS and telecommunications are often a bound and committed couple, transforming executives into counselors and creating one of the key information technology management topics of the 1990s.

"One is surprised at how hard one has to work to [merge the two cultures] successfully," said David Edison, executive vice president of Westinghouse Communications Systems, a division of Westinghouse Electric Corp. in Pittsburgh. "We thought they would combine more thoroughly than they did." But the effort overall was worthwhile, Edison added, because the merger "probably freed up 25 percent of the people involved in one way or another" and allowed Westinghouse to put added resources into such previously underdeveloped efforts as in-house engineering.

Westinghouse Communications began as the means to link the conglomerate's far-flung business units to its research and development activities and to corporate headquarters in Pittsburgh. But since its inception, the network has grown to be a commercial provider of network services to other companies, owning network switching centers in New Brunswick (N.J.), Pittsburgh, Chicago, San Francisco, Dallas and Atlanta, and sharing another with the Chesapeake & Potomac Telephone Co. in Baltimore. Its centers sport "ISDN-ready" switching computers from Northern Telecom Inc. in Nashville, Tenn., and control more than 300 high-capacity circuits in North America. A center in Brussels, Belgium, handles European connections.

Overall, Edison reported, more than a third of Westinghouse's IT spending is absorbed by the costs for the wide-area network. And after a year of soliciting outside business, about half of the traffic on the system comes from non-Westinghouse customers. Selling the service was part of a strategy to reduce unit costs by increasing total activity, since "this is a volume-driven

DAVID EDISON: *Bringing together the worlds of voice and data has been a delicate, bottom-up team-building process.*

business," Edison said. Today, he added, the cost-per-unit of sending data over the system currently is "less than half" of its 1982 peak.

With the conversion of Westinghouse's corporate telephone network to a modern digital system, it became technically feasible, even desirable, to merge the voice and data networks. However, Edison said, getting the people from both fields to work together smoothly proved to be problematic, since "there are significant differences between the two groups.

"The voice world is very cost-driven," he said. Voice people believe that "it's always possible to work around a fault [or break in a circuit]. The data world, however, is very service-driven. . . . They are extremely quality-conscious . . . because they have to be error-free. A minor problem on a voice network is easily handled, while a minor problem on a data network may in fact cause total disruption."

Blending the two groups into a functioning whole was almost a textbook case of managerial basics. "You have got to listen to every point of view, . . . find the consensus . . . and make a decision that everybody buys into," Edison said. "We spend more than 50 percent of our management time on team issues."

Melding the two groups into a sin-

PHOTOS BY JACK VAN ANTWERP

EDISON: *"You have to find the consensus and make a decision that everybody buys into."*

gle team called first for a specific managerial style—in Edison's words, "participatory, rather than top-down. . . . We let everybody decide for themselves what is common between the two groups." In addition, he said, the development of straightforward administrative procedures like trouble ticketing—keeping written records of network problems and repair efforts—became a key forum for inspiring consensus because it highlighted for both groups how similar their worlds had already become.

An effort to improve service to the network's users also helped to facilitate the merger of the two cultures, as both needed to learn the same customer-relations skills in order to compete in the free data-network marketplace. "Sensitivity to customers . . . doesn't come naturally to people who are very much dedicated to resolving problems," Edison said. "They see themselves as being problem resolvers, not as being customer communicators." The prescription was a formal customer sensitivity training effort, and the common experience added strength to the growing bond between the two groups.

There were also disruptive experiences and a certain amount of ill will left over from the compulsory change. Edison learned that "people tend to be very territorial," he said. "Many people see their span of responsibility as direct measure of their progress," and when the voice and data control centers were moved, some people had to lose positions of power as staff members from the other group took over their roles.

Edison's remedy was to "skillfully promote the idea of freeing up resources" for new challenges. For example, the control-room merger "freed up one of the staff to become the engineering manager"—a position that previously hadn't existed.

Edison said that while there was no "overt" opposition to the voice/data marriage, there was passive resistance. "What we had was a lot of counter proposals—people who had their own pet views about how the change should occur. . . . They were really saying that they were not ready for change."

Edison said he allowed the debates to continue until it became apparent to him that discussion had degenerated into filibuster, and that there was "nothing new" being put on the discussion table. "We had entertained quite a few alternatives . . . but at some point we said, 'Enough! Put your last counterproposal on the table.' That sort of pushed everybody over the top."

> **While there was no "overt" opposition to the voice/data marriage, there was passive resistance. "What we had was a lot of counter proposals—people who had their own pet views about how the change should occur. They were really saying that they were not ready for change."**
>
> *–David Edison*

One year into the voice/data marriage, Edison said there is little that he would like to have done differently. "One tends to live with status quo," he said, "[but] the truth is, there's a natural evolution in these things—a rate at which people will accept change. We ended up with an excellent change here. Everybody's happy; there are no complaints."

Edison said that CIOs required to broker a voice/data union in their organizations can achieve similar results if they allow some basic precepts to guide their actions.

"Take your time with the human side of it," he advised. "It's well worth your while to try to get round pegs into round holes. You don't need to force this too much.

"There was nothing magic about it," he concluded. "Good human-resource management practices work here too." CIO

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OPPORTUNITIES

Pipe Dreams

If a network is the sum of its potential uses, where do the main opportunities lie for making the pipe pay off?

BY MEGHAN O'LEARY

Paul S. Henry has a vision of the business future that is at once enthralling and chilling. He sees a computer—ultra-powerful and ultra-connected—that is able to access any conceivable information source; handle data in any form; and anticipate, project and suggest rather than just respond to typed-in commands. "It's sort of like HAL from 2001," he explained, "except that that computer went nuts at the end."

No science-fiction writer, Henry is director of AT&T Bell Labs' Crawford Hill Communications Systems Research Laboratory in Holmdel, N.J. He envisions an IT-based business scenario "where people and computers are linked together in conversation." His "knowbot," as he likes to call the ultimate computing aide, is no pipe dream but a realistic (albeit not imminent) application, if today's business needs and trends in telecommunications and computer technology are any indication.

The business needs driving Henry's vision are perhaps the three most talked-about issues in business today: globalization, customer relationships and cost effectiveness. As such, they are also the three biggest opportunities for CIOs and technology providers. Globalization is becoming more feasible as economic

ILLUSTRATION BY JAMES STEINBERG

and political barriers fall the world over and corporations see opportunities to manufacture as well as market internationally. Customer service has taken on greater importance as competition grows in many markets, with each provider trying its best to cement relationships by providing more and better services. And within each of these arenas, companies are trying to provide the best performance at the least cost.

The success of any of these undertakings turns on a vast array of communications platforms and applications, many of which are in widespread use already; some of which are still in the testing and integration stages. For instance, bandwidth is getting cheaper. Fiber-optic cable and ISDN are providing reliable, fast transmission of huge amounts of data. Though still a fairly nascent platform, ISDN holds out the promise of integrating voice and data applications. Gateway technology allows communication across hybrid networks. Improved compression technology allows users to send data-intensive image and video files. And cellular modems and satellite networks are offering communications and applications where terrestrial lines aren't possible or practical.

People with an eye on the future of telecommunications speak of communications and front-end tools in the same breath. Despite all the excitement over transmission technologies, they are merely a vehicle to get data, voice or image from here to there faster or more cheaply. What gives these vehicles value is what we do with them on the front end. Electronic data interchange, for example, not only saves time and paper shuffling, but it establishes business bonds between companies and clients that go beyond the electronic connection. Multimedia messaging promises to add depth and dimension to flat electronic messaging by allowing users to include voice and video with data and image files. And screen sharing lets people in different places collaborate more effectively.

These technologies are the key to translating need into opportunity, according to CIOs, vendors and consultants. From a macro perspective, they offer companies the chance to effect a broad reach without diluting their effectiveness and competitiveness, and to do it as readily as we dial a phone.

For many in the telecommunications industry, globalization is a foregone conclusion. "Companies will really have to be trans-national," said Jose Collazo, chairman and president

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of Infonet, an international networking company located in El Segundo, Calif. Collazo points to the near extinction of the vertically integrated corporation as an example of companies' willingness to go wherever good business sense takes them. From a cost perspective, he explained, companies will "have to do manufacturing [and R&D] wherever it's best to do [them], . . . and they'll have to market in [yet] another country." What's more, he added, in spite of operating in a global, decentralized environment, these companies will still have to be able to react very quickly to changes in the marketplace.

Under the theory that you don't need a sledgehammer to kill a fly, user companies have begun to demonstrate that simple applications can accomplish a great deal.

Effecting that global reach without becoming numb to market climates or going broke requires a flexible and reliable network, according to Ron Bamberg, vice president of business development and planning for BT Tymnet in San Jose, Calif. Bamberg pointed out that information becomes an increasingly important resource in the process of globalization. Globalization "goes well beyond importing and exporting," he said. "It involves the establishment of complete business systems in a number of different countries." Coordinating those systems "is really an information problem. As globalization occurs, you've got a disconnection between facilities, raw materials and production processes. Tying those [functions] together in a near-real-time situation is . . . essentially making that collection of global processes a virtual centralized factory."

Cheaper, more available bandwidth will enable companies to establish those necessary links, according to Dan Cavanagh, senior vice president of information systems for the Metropolitan Life Insurance Co. in New York. Cavanagh is hopeful about the ability to pull together voice, data and images from any point in the world. "It means [having access to] data on customers and [providing] services that you couldn't afford to offer before," he said.

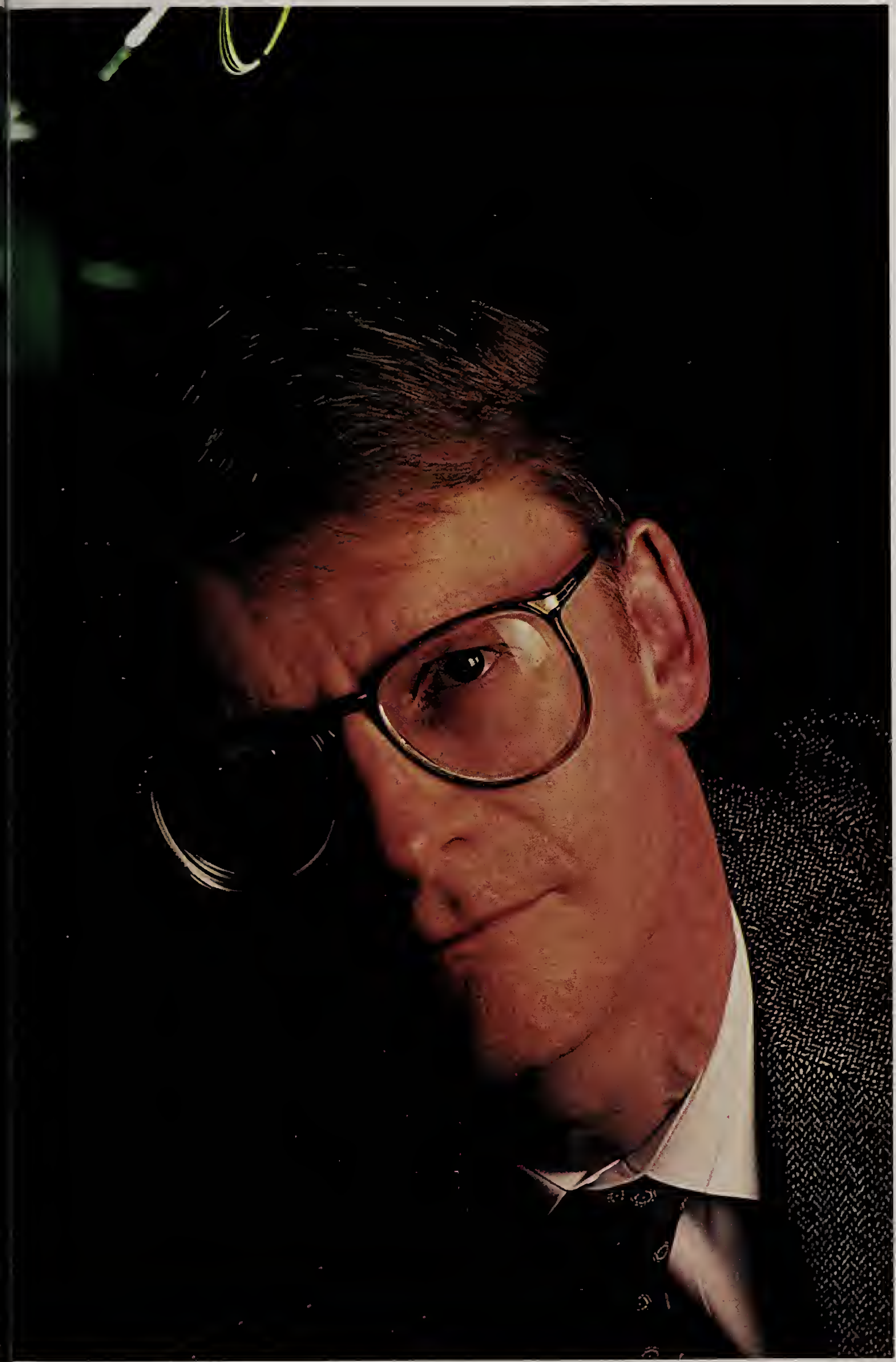
One platform that promises to help bring about the kind of integration Cavanagh describes is ISDN. The jokes circulating about this promising standard highlight the fact that it has few demonstrable business uses. But proponents argue that this is because suppliers of the service and equipment have yet to catch up with or even fully understand the technology. Paris Burstyn, director of telecommunications research and consulting for the Business Research Group of Newton, Mass., likens ISDN's slow growth to that of electricity. "Not only did Edison have a problem selling it," Burstyn said, "but he didn't have a clue as to what people were going to be doing with this infrastructure once it was deployed."

According to Bell Labs' Henry, "the reason ISDN is important is that in the future, communications will be more than just a point-to-point phone call between you and me. If that's all we wanted, we wouldn't need signaling and control. But I might want, at the same time, to have access to my knowbot and a file."

According to Burstyn, the foundations are still being laid for ISDN applications. "People are yelling and screaming and saying there are no ISDN applications beyond ANI [automatic number identification]. But it's pretty early in the ball game here. People should push equipment manufacturers in the directions they want. This isn't trivial. A lot of software has to be written; regulatory questions have to be answered; equipment has to be bought."

PAUL HENRY: *In the quest for universal information acce*

One application that may have important implications for global transmission services is NYNEX's Washington-area trial of Gateway Information Services Technology (GIST) from Siemens Information Systems Inc. in Boca Raton, Fla. NYNEX is providing customers with access to a menu of



he telecom business will be governed by the "inseparability" of computer and communications technology.

calling and data-transmission services from their computers. The Siemens gateway switches them away from the menu to services they choose and then back to the menu without disrupting the connection, according to Burstyn. ISDN makes this possible by signaling the calling terminals to identify themselves and activating applications that record times and charges for the services chosen.

The transmission and messaging technologies that will make globalization a reality will also set the stage for applications allowing companies to hold down telecom costs while cementing relationships with their customers. "Customers today are expecting high levels of service," Collazo said. "We're in a very competitive, global world, so having low costs and being able to provide services at low prices is part and parcel of what's required to win business today."

CIOs agree that the key to success in these applications is judicious integration of network services and computers. Under the theory that you don't need a sledgehammer to kill a fly, user companies have begun to demonstrate that simple applications can accomplish a great deal. At Met Life, for instance, a voice-response system lets customers check on balances in savings and retirement-fund accounts. With voice response, the information is available to customers at any time, Cavanagh pointed out, and the transaction is highly confidential.

In a more complex application, San Francisco-based drug wholesaler McKesson Corp. tailors its applications to individual retail customers, according to Vice President of Information Services John W. Fitzgerald. The company operates a nationwide automatic ordering and inventory system. It also keeps detailed profiles on its customers' stores, margins and ordering patterns.

While the network is a powerful tool in itself, the combination of the network and the company's information systems proved invaluable recently when the roof of a distribution center in the Las Vegas area collapsed from heavy rains. The city declared the distribution center a disaster, and McKesson employees were unable to get in to access orders. McKesson used its customer profiles to reconstruct the orders and then transmitted them to another distribution center in Southern California. A Sunday-morning disaster that could have resulted in hundreds of missed deliveries of critical drugs ended up causing only a two-hour delay. "It's really kind of neat," Fitzgerald said, "because it does show that when you use the computers and the networks

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Effecting a global reach without becoming numb to market climates or going broke requires a flexible and reliable network.

properly, you can really serve [customers] better."

Such individual attention to customers is fast becoming a competitive necessity, according to Jim Hynes, president of the Fidelity Telecommunications Co., a subsidiary of Fidelity Investments in Boston that provides telecommunications services. "If I know who you are before you get into my system, I can direct you into the appropriate customer-service organization," he explained. "If you are a million-dollar customer, for instance, I want to bring you into my special, high-level service group, whereas if you're somebody with $3,000, I can put you into the general pool."

From a marketing perspective, this kind of customer service makes a company easy to do business with, according to Robert A. Mercer, senior vice president for Hatfield Associates Inc., a consulting firm in Boulder, Colo. Companies whose customers include other companies are beginning to take that concept one step further in the form of a collaborative application—electronic data interchange.

EDI's efficiency translates into both direct cost savings and value-added benefits. "A lot of our staff is there because there's a paper in the in-box that has to have something done to it to go to the out-box," said David Norem, chairman of the Government Service Group of the North American ISDN Users Forum (NIU) and an employee in the Office of the Secretary of the Department of Defense (DoD). At NIU member companies where EDI has been implemented, he said, it has made a tremendous difference in the smooth running of the business, allowing companies to operate with small inventories and less paperwork.

"If you're supplying a large company and you can convince them that you can deal with them in a friendly, easier manner through EDI, then you have a leg up on your competitor," said Mercer.

In addition, pointed out Claude Stone, vice president of EDI market development for the First National Bank of Chicago, the increased efficiency of EDI transactions allows some companies to handle more business. This can be an important selling point for suppliers in light of the growing trend on the part of many companies to simplify their operations by reducing the number of suppliers they deal with.

According to Norem, by putting processes, inventories and cost structures up front, EDI promotes a better, more productive relationship between customers and suppliers who can react quickly to market demands and production schedules.

In most businesses, however, there are transactions that require more human involvement than a keyboard entry. One of the initial criticisms of electronic communication was that it was impersonal. Improved electronic-mail and voice-messaging systems have helped to change that, but users today require more sophisticated, more flexible means of communicating.

Mercer sees a great deal of untapped potential and flexibility in voice messaging, which is generally used today in lieu of a human message-taker. For example, he said, "if I were selling office supplies, with voice messaging I could compose a message saying you [could] save 20 percent [on a particular item]. I could

DAN CAVANAGH: *More bandwidth at lower cost equals a broader practical information reach.*

PHOTO BY KENT HANSON

JOHN FITZGERALD: *An effective network can keep disaster at bay.*

send it to 500 customers and not go through a mailing and placing individual calls. The notion that I could sit here and quickly spray a message out to people where it's got the personality of my voice—I think that's a big comer."

Frank Dzubeck, president of Communications Network Architects Inc. in Washington, takes that enthusiasm a step further in his description of multimedia messaging, which will encompass data, image files and even video. According to Dzubeck, multimedia messaging can inject a high-touch aspect to what was formerly a detached, high-tech communication. "I may want to take information like an E-mail message, graphs, and voice annotation [and] append that to something else like a visual image of a discussion. I can send that whole thing as a compound document. When you replay it, you have the full scope of what's taking place." According to Dzubeck, that can cut down on unnecessary communication and allow people to communicate more fully.

In its complexity, multimedia messaging promises to simplify things, pointed out NIU's Norem. Norem's employer, the DoD, communicates daily with outside vendors and other government agencies on equipment specifications, standards, engineering information and environmental conditions. Any changes to drawings and specs must be submitted, discussed and agreed upon. Regular phone messages combined with paper submissions don't have the cohesiveness or completeness of multimedia messaging. Because multimedia messaging would allow detailed interactions, Norem said, it could speed up the process. The addition of a real-time screen-sharing facility, which would let one user see a change as another user made it, would enable them to complete the process in a single transaction.

These tools add the dimensions of subtlety and inflection to electronic communications, according to Mercer. "I could be talking to somebody with a voice message and intersperse it with some electronic viewgraphs. And at some point [in the voice message] I could say, 'I'm sending you a little clip. Joe Blow got up at the meeting and made an impassioned plea and I could never convey it properly, so here it is.' "

In light of the possibilities of multimedia messaging, some industry watchers put forth the idea that the real business issue for the '90s is the humanization of technology through these tools. The greater flexibility of telecommunications will finally transform technology and the business use of it into a personal interaction, with as many facets as a face-to-face meeting—including the faces. We're "going to return to the way people did business before computers arrived," Dzubeck said. "Business changed to accommodate the information-processing concepts. The information-processing concepts didn't accommodate business.

"It's not gathering information and moving it that creates competitive advantage," he added, "but what one does with the information. Humanization has to do with reducing complex forms of information that one has in digital form . . . into more graphical and more image-oriented presentation forms." Sophisticated presentation forms such as imaging, full-motion video and screen sharing, backed up by cheap, fast, flexible communications, Dzubeck argued, "will start to allow the human mind to comprehend things the way we [naturally] comprehend things—[aurally] and visually."

"One of the things we're going to see more of is that communications won't just be more of the same things," added Henry. "It will [involve] far more complex conferencing and interactions with computers."

Despite their optimism about emerging communications opportunities, users and vendors acknowledge that they have a few significant stumbling blocks to overcome. From a pure business perspective, it is necessary to balance the investment needed to establish a robust communications system with prudent business practices, according to Fidelity's Hynes. "I think there are some physical restrictions in terms of the ability to develop applications quickly enough

PHOTO BY DAVID POWERS

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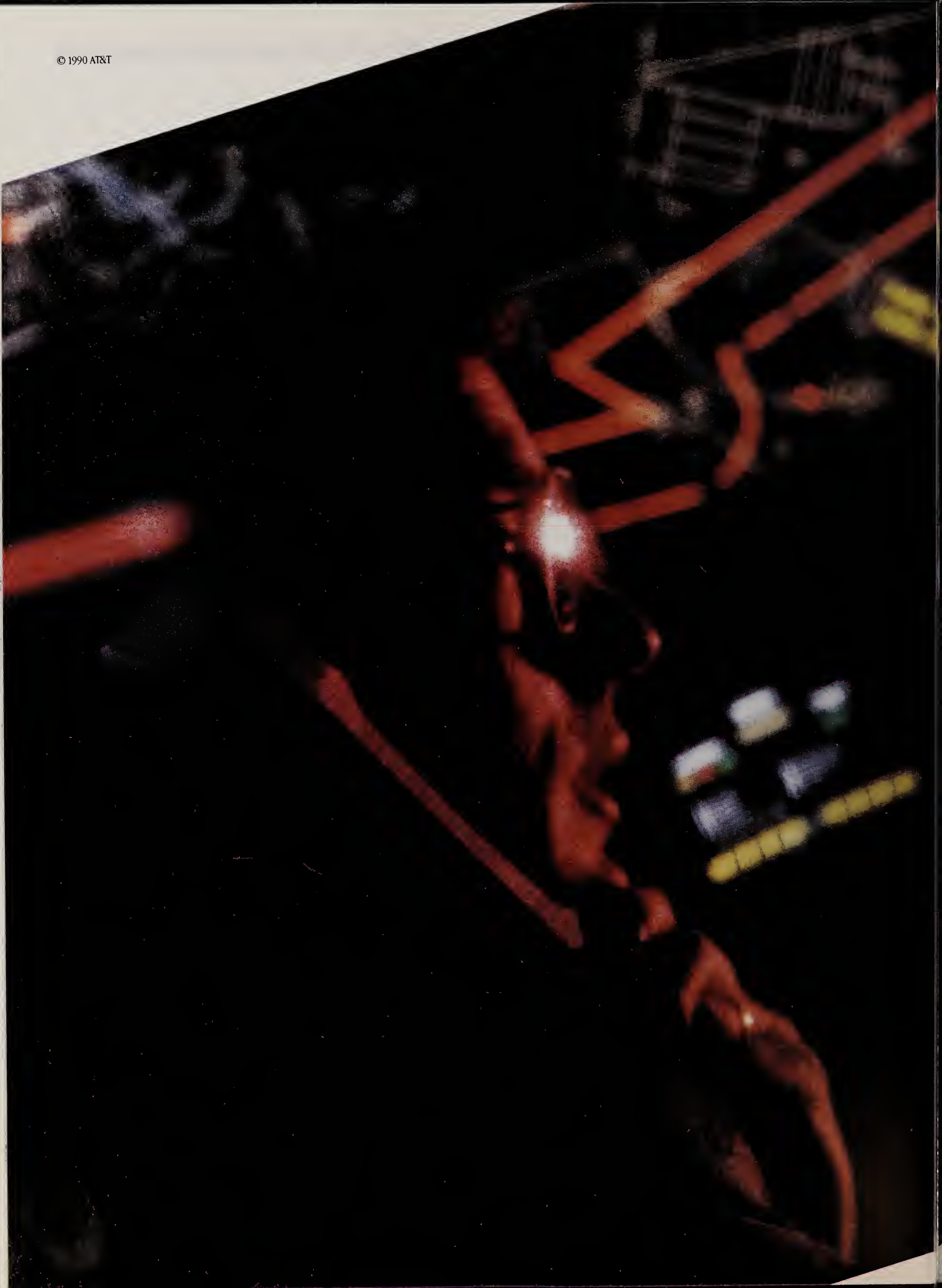

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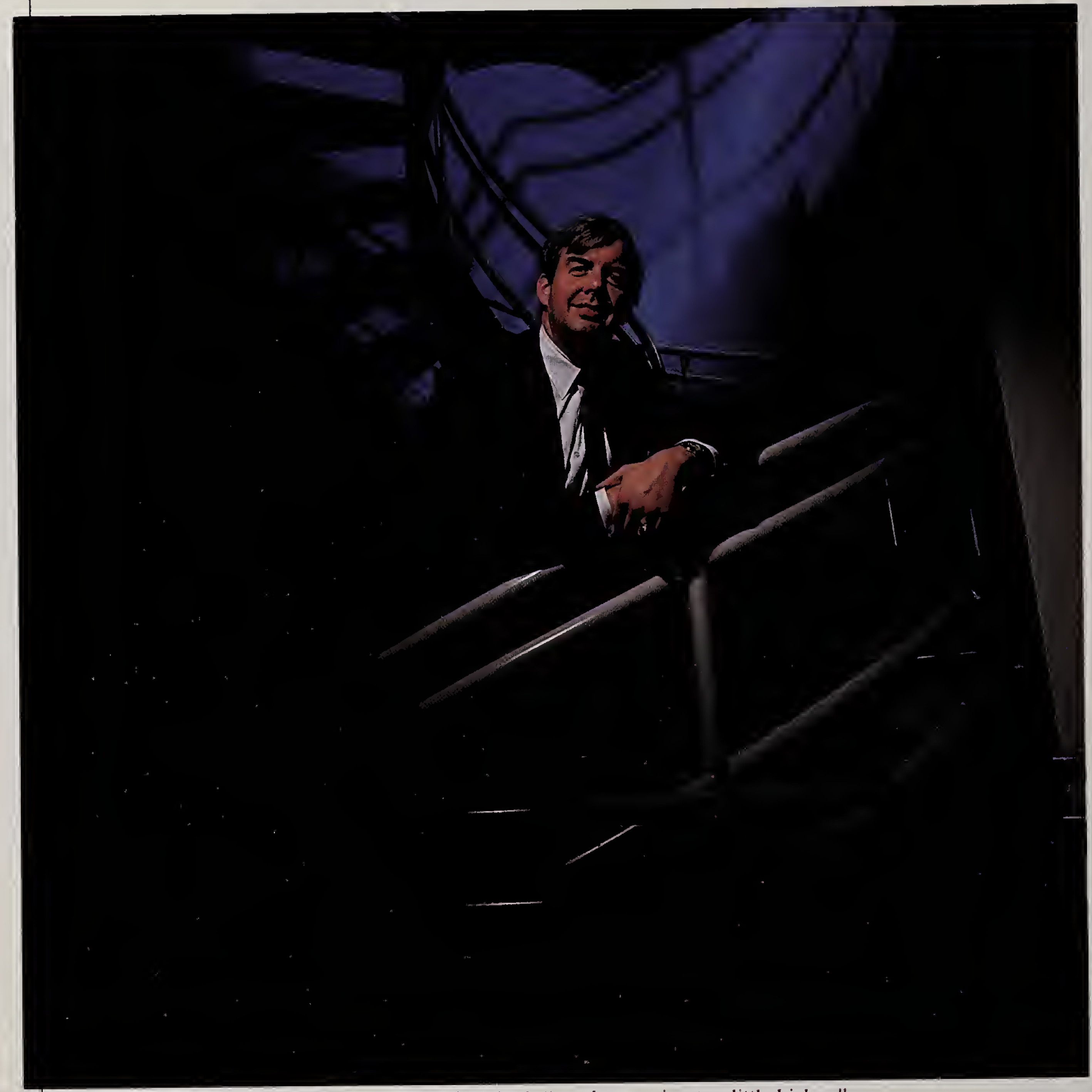

JIM HYNES: *When the customer-service bar is raised, "you have to jump a little higher."*

to respond to things, yet at a reasonable enough cost so you are not sinking your company's future," he said. "Every time someone in the industry raises the bar in customer service, you have to jump a little higher. If you've gone to your [limit] on a new service, you're less capable."

And if a company were to invest heavily in transmission facilities, it would soon discover that front-end renderings of available technology have some catching up to do. Those hardware and presentation tools that are available tend to be expensive and awkward, Hynes pointed out.

"All of these things require simultaneous advances in communications technology and computer technology," Henry said. "If there is any one theme that I think is going to govern the telecom business, it's the inseparability of those two things."

Ultimately, according to Roy Merrills, president of Northern Telecom Inc. in Nashville, Tenn., "the technology won't limit us, but ingenuity and commitment might." Users must push for what they want, and vendors must cooperate on standards, he said.

"What we don't have quite yet is a pocket-sized communicator that is useful just about everywhere," said Henry, "[but] I think that will come to be. I believe the technologies will be standardized so that your personal communication set—your Dick Tracy radio—will come to be like a phone. You don't think about your phone as being standardized, but it is. You can call any phone in the world."

Since ISDN is positioned and has largely been accepted as an international standard, advances in that arena will put pressure on vendors to integrate services into single lines and terminals, according to Norem. "The problem is that none of the people supplying the telephone, TV and data lines have the expectation of providing all those different types of data. [But] users expect cost breaks and . . . simpler contracts." The only way to satisfy that need and propagate the industry is to agree on some ground rules.

Perhaps the biggest barrier to the communications opportunities of the '90s, according to the First National Bank's Stone, is education. Despite the fact that EDI is possible today and offers tremendous productivity gains, fewer than 15 percent of the transactions that could be performed using EDI actually are. "What it really is is a philosophy of doing business," said Stone. "It takes time to educate [people] to that." In addition, many of the opportunities in communications will require collaboration, or at least cooperation, between companies that may see the business benefit but chafe against the requirements of the relationship.

Today, according to Collazo, big business is driving the use of these technologies and will likely encourage widespread use of them by sheer momentum. "If larger corporations are affected by cost containment and globalization," he said, "then their suppliers and clients will probably be too."

Mercer put it in more specific terms. If you're an auto parts supplier and "GM says [they're going to commit to EDI]," he said, "you'd better figure out a way to do it." CIO

PHOTO BY GEORGE SIMIAN

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OPPORTUNITIES PROFILE

Ship 54 – Where Are You?

For American President Companies, delivering the goods also means knowing where they are at any given instant

BY PAUL KONSTADT

It's ten o'clock. Do you know where your children are? Prime-time television has made that question a ubiquitous reminder for parents, but in the transportation industry, it has become a business dictum of growing importance.

Traffic managers and fleet dispatchers need to know exactly where their trucks, trains and ships are at all times. That is a key reason that the most sophisticated and competitive companies, like the American President lines, spend handsomely on systems to gather and distribute that information as quickly as possible.

"A lot of our opportunity tracks are really communications-based," said James Marston, senior vice president and CIO of American President Companies Ltd. "The industry has lagged for some time, but I think that most of our major competitors now have information systems that support their operations."

American President's cargo ships link Japan, India, Taiwan, Singapore and Hong Kong in Asia with Seattle, Los Angeles and Oakland, Calif., in the United States. Its trains carry stacked cargo containers between those West Coast points and railheads in South Kearney, N.J., and Atlanta; and its trucks fill in the gaps between dock- or railside and customer.

A network of cable and satellite connections covers the United States, Canada, Mexico and the Pacific Rim—more than 120 locations on three continents—and will soon tie the Indian subcontinent to the Middle East, then reach across the Atlantic Ocean.

The network's strategic reason for being is to monitor the progress of each shipment from source to destination and to provide that information on demand, a ser-

JAMES MARSTON: *In the shipping industry, information technology has become a widely accepted competitive tool.*

vice required increasingly by shippers and manufacturers worldwide. "We have a system that customers can access that allows them to do their own tracking," Marston said. "Providing that information component is a key element of the service we offer."

At the center of American President's network is an IBM mainframe-equipped data center in San Mateo, Calif., backed up by an Amdahl unit nearby. Funneling the data to the mainframes is a ring of T1 lines circling the United States, plus satellite and sea-bed cable links to Asia. "We are driven by the need for a high level of availability—24 hours a day, seven days a week," Marston said. "We have an intelligent network [that] can sense disruptions and reroute traffic." That capability comes from widely available intelligent multiplexers—the boxes that meld the

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trickles of data from a number of local sources into one high-volume stream for the network. These devices are located at intervals along American President's continent-wide data loop. When a multiplexer senses a break in the flow between it and the mainframes, the machine reverses the current to reach the data center from the opposite direction.

That duplication is repeated in the design of the Asian branch of the network. Its primary communications hub, and the western terminus of its main trans-Pacific link, is in Kaohsiung, Taiwan, the main port city on the island. That hub is connected in turn to 50 locations in 20 Asian countries, but some of those other units are also linked directly to the United States to provide alternate routes in the event of a circuit failure.

Corporate information processing is done at the California data center or at subsidiary locations in Asia and Atlanta; only location-specific things such as local customs forms are done by computers in the field. That centralized architecture requires significantly greater network capacity than distributed processing would, but Marston believes that available distributed solutions could not meet American President's needs. “One of the things about our business is that it's very much like the airlines,” said Marston, who previously held a similar position at AMR Corp., the owner of American Airlines. “The reason that the airlines' systems are centralized is that they want all their information available to everybody in the system. . . . Our container business is . . . that way too.”

> **“We have a system that customers can access that allows them to do their own tracking. Providing that information component is a key element of the service we offer.”**
>
> *–James Marston*

Marston is replacing his satellite links with fiber-optic cable, which he hails as “the wave of the future,” as it becomes available. As a matter of purchasing policy, he said, American President “specifies” that circuit providers use fiber-optic cable for transoceanic links, and land-based paths—whether fiber, metallic cable or microwave—for other connections. The company does of course use satellite links to stay in touch with its ships, and it also uses some satellite channels for backup.

AN AMERICAN *President Lines ship is loaded (above) at the company's Oakland, Calif., terminal. Double-stacked freight containers travel on a “stacktrain” (right) operated by an American President Companies rail subsidiary.*

PHOTOS COURTESY OF AMERICAN PRESIDENT CO. LTD

From the outset, the goal of American President's worldwide information system has been to provide the most up-to-date reports possible on the movement of goods along the transportation network. Initially the system relied on input from human observers at checkpoints and transfer stations along the way, but now newer technologies are allowing the company to automate data collection and make it more pervasive.

Tracking individual containers from fixed observation points is one of the strategic monitoring tasks handled by the network. The company has placed RF chips—small

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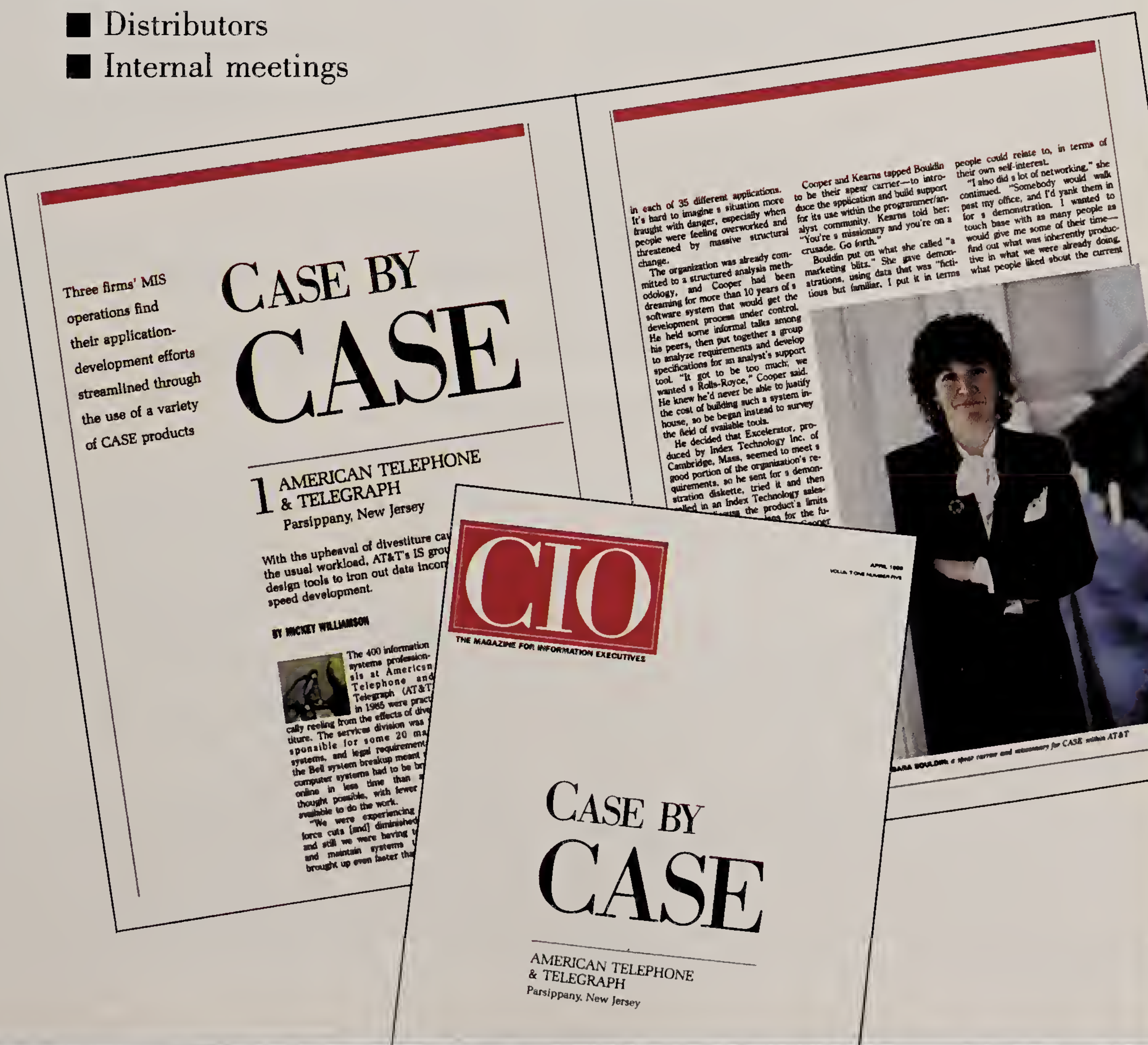
Three firms' MIS operations find their application-development efforts streamlined through the use of a variety of CASE products

CASE BY CASE

1 AMERICAN TELEPHONE & TELEGRAPH
Parsippany, New Jersey

BY MICKEY WILLIAMSON

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A CONTAINER SHIP, *one of five of its class operated by APL, leaves San Francisco Bay.*

PHOTO COURTESY OF AMERICAN PRESIDENT CO. LTD

electronic tags that respond to a predetermined radio frequency—on about 10,000, or 10 percent, of its shipping containers. These high-tech labels carry encoded information that can be scanned and read quickly by unobtrusive radio devices installed at ship docks, in rail yards, or along main travel routes. These in turn are connected to the data network by inexpensive land lines.

The actual benefits of the technology are still being studied, but Marston expects that more precise data on shipments and their locations will allow American President to push higher-priority cargoes along the transportation network more quickly. For example, a specially developed artificial-intelligence program can use that information to decide which containers should be placed on the top of the ship and which can go on the bottom. The uppermost containers can be offloaded first and sent on their way immediately, saving as much as a full day's transit time compared to the containers at the bottom of the pile.

> **From the outset, the goal of American President's worldwide information system has been to provide the most up-to-date reports possible on the movement of goods along the transportation network.**

"It promises to be a big boon," Marston said.

While tracking individual containers automatically as they pass fixed checkpoints has proven to be achievable at reasonable cost, following the progress of container-carrying vehicles around the globe seems to be a more daunting task. Mobile satellite transmission systems are already in fairly common use for ship-to-shore applications, and American President's ships are equipped with advanced communications systems. "They can talk to us on E-mail," Marston said. But with advances in antenna design and transmitter circuitry, it is now also possible to mount a satellite earth station on board a truck or railroad locomotive. These extremely compact mobile units can provide precise location and operating status data to the dispatch office almost continuously, but they cost several thousand dollars per unit, which is probably too expensive for mass use in the local truck fleets American President uses to move containers to and from its rail and ship terminals. "You can spend a lot of money outfitting a truck," Marston said. "The systems tend to have a fairly high price tag, and trucking operations tend to have fairly thin [profit] margins."

A potentially less costly solution for real-time vehicle monitoring, said Marston, and one that would be attractive to American President if and when it becomes commercially viable, is the literally blue-sky (or even upper-atmospheric) meteor-burst technology. As meteors enter the Earth's atmosphere and disintegrate, they leave a trail that is capable of acting as a mirror for radio waves. These "mirrors" are effective only momentarily, and one that is located at the correct angle for a specific truck and base station can offer just about enough time to get the status and location data from the vehicle into the permanent network. Two small startup companies are currently trying to develop economically viable ways to exploit the phenomenon, which was discovered by Defense Department researchers more than 30 years ago.

"The information component is a very, very key element in each one of these new technologies," said Marston, "[and] all of these things help the company manage the process adequately to live up to its commitments." CIO

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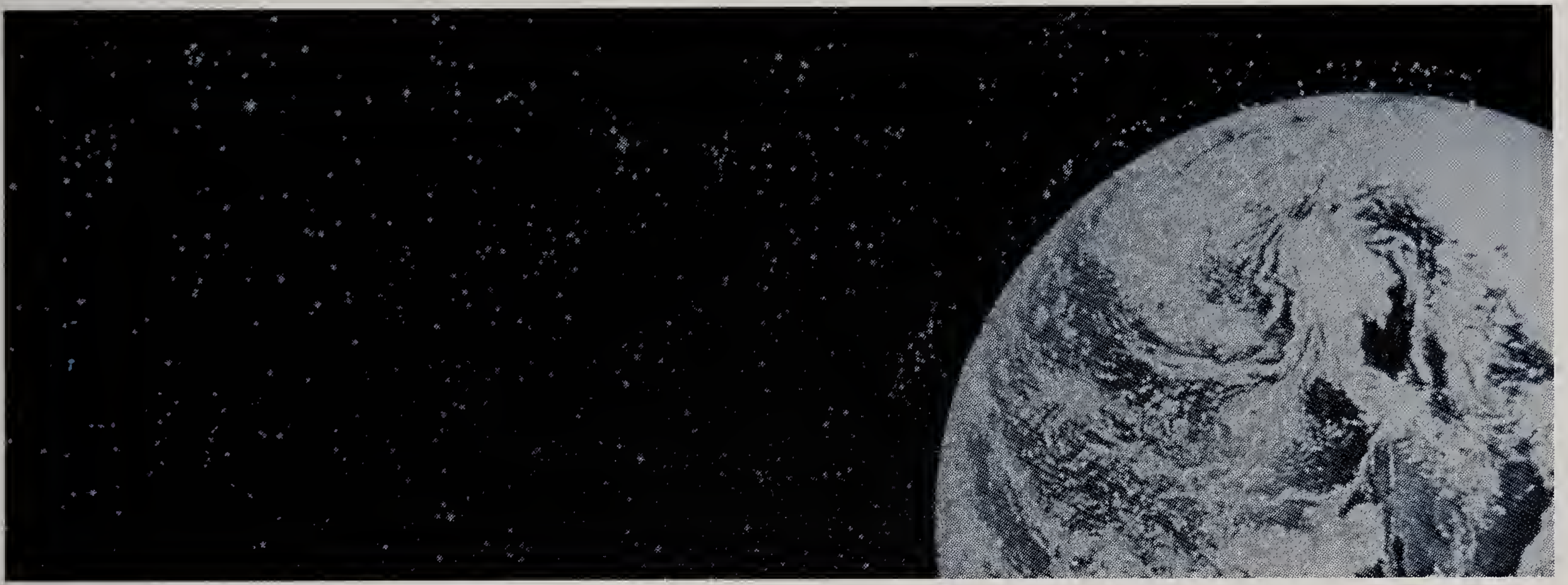

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Communications Handbook

A Guide for the Perplexed

Baffled by the abundance of telecom-specific terminology, acronyms and specifications? You're not alone. Many of our readers confessed to a certain amount of confusion when trying to make sense of telecommunications. We hope that this section, created with the invaluable aid of Datapro Research, a computer and communications information-services provider in Delran, N.J., will help to cut through some of the fog and serve as a guide for CIOs as they chart their companies' courses into the global '90s.

Included are a glossary, a breakdown of standards and standards-setting organizations, charts of the various telecommunications media, a guide to value-added network providers and their products, telecom job specifications, and a listing of colleges and universities with graduate programs in telecommunications.

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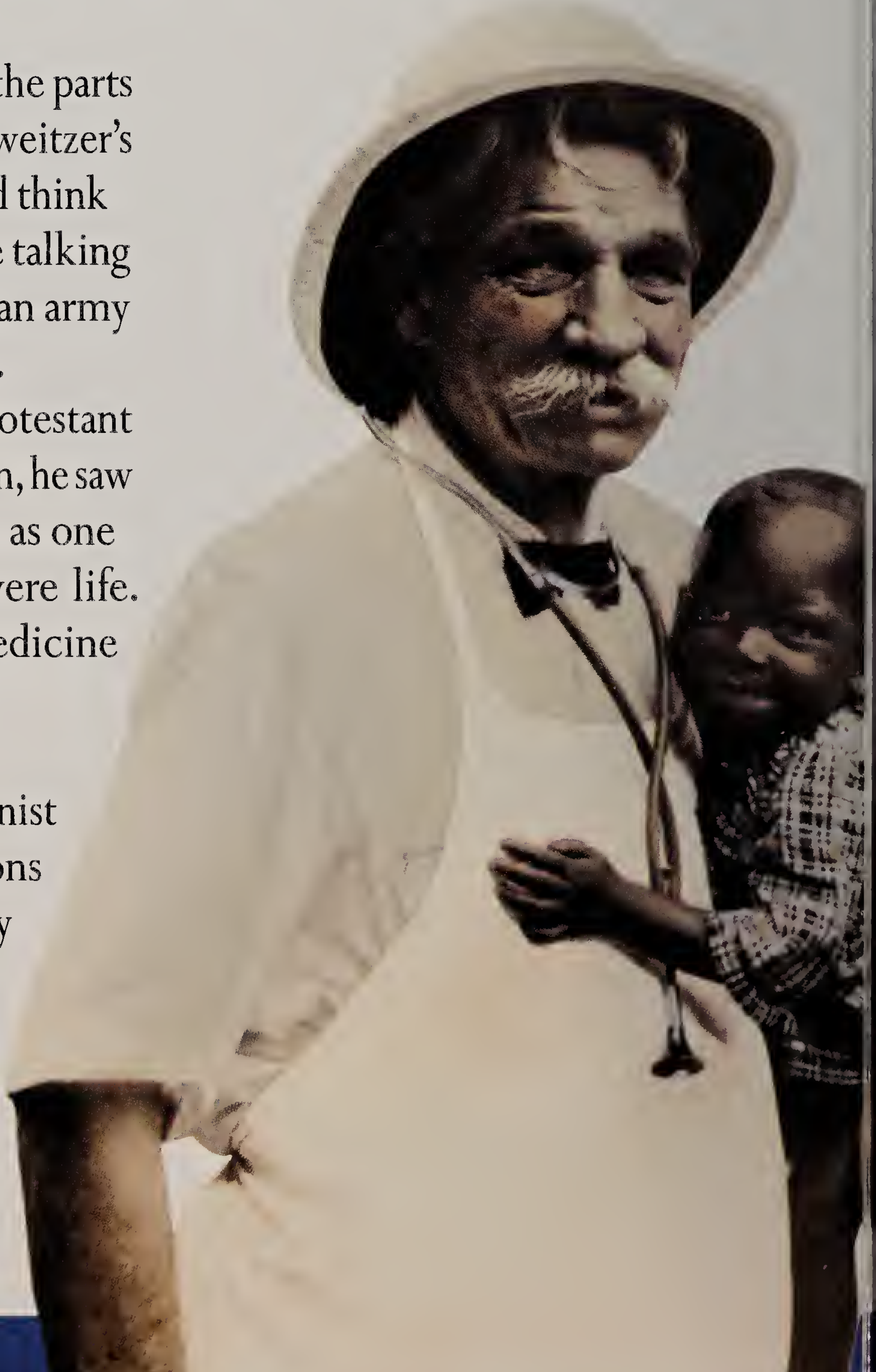

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his philosophy, and was just another case, a whole country.

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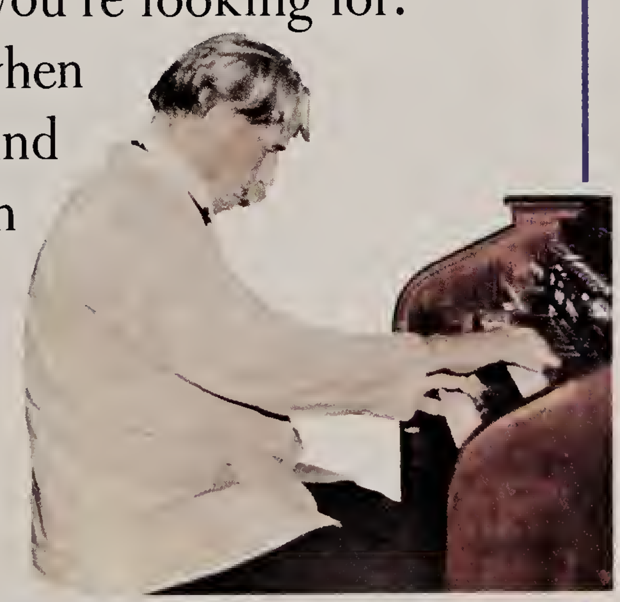

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Setting the Standards

A communications standard is really just a set of guidelines that a lot of people agree to use. All of the standards listed below are accepted and used in the United States (with the exception of EDIFACT, which is primarily a European standard). Most are used in Europe to varying degrees, and there are ISO equivalents for most IEEE specs. Each standard is specific to a certain kind of network layout; for example, CCITT's X.25 governs packet-switched wide-area networks. As far as EDI goes, most people choose a standard based on what their particular industry is using at the time.

The Open Systems Interconnect (OSI) set of standards encompasses a number of different standards. They are usually, but not always, set by ISO, and then adopted by other standards bodies. Most CCITT and IEEE standards are ISO-approved (or pending approval).

The term "de facto standard" refers to proprietary architectures—SNA, DECnet, etc.—that specify the rules for communicating among computers of one particular vendor. However, most of the major vendors, with the exception of IBM (which is committed to SNA), are moving away from proprietary architectures and migrating toward OSI. IBM has agreed to support OSI connections, but on a gateway basis only.

The Standards Bearers

INITIALS	FULL NAME & LOCATION	DESCRIPTION	STANDARDS
ANSI	**American National Standards Institute** New York	U.S. representative to ISO.	X12 FDDI Cooperates with ISO, CCITT & IEEE standards
CCITT	**Consultative Committee on International Telephony and Telegraphy** Geneva	Standards-setting committee of the International Telecommunications Union.	V.32 X.25 X.400 ISDN Works with ISO on OSI
ECMA	**European Computer Manufacturers Association** Geneva	Vendor consortium. Sets standards in Europe for computer and communications technology.	Works in cooperation with ISO, CCITT and U.S. organizations
IEEE	**Institute of Electrical and Electronics Engineers** New York	Sets data communications standards.	802.x LAN standards
ISO	**International Standards Organization** Geneva	Non-treaty organization to promote standards. Every representative country gets one vote. ANSI is U.S. representative.	Sets OSI standards ISO 7498 (ISO basic reference model) ISO 8571 (FTAM) ISO 9735 (EDIFACT) DIS 9596 (CMIP) DIS 9072 (ROSE)

SOURCE: DATAPRO RESEARCH

Standard Brands

STANDARD	DEVELOPED BY
AMIS* Audio Messaging Interchange Specification	**AMIS**
CMIP* Common Management Information Protocol	**ISO**
DIS 9072*	**ISO**
DIS 9596*	**ISO**
EDIFACT EDI for Administration, Commerce and Transport	**ISO**
FDDI* Fiber Distributed Data Interface	**ANSI**
FTAM File Transfer, Access and Management	**ISO**
IEEE 802.x	**IEEE**
ISDN* Integrated Services Digital Network	**CCITT**
ISO 7498	**ISO**
ISO 8571	**ISO**
ISO 9735	**ISO**
ROSE* Remote Operations Service Elements	**ISO**
SONET* Synchronous Optical Network	**Bellcore**
V.32	**CCITT**
X12	**ANSI**
X.25	**CCITT**
X.400	**CCITT**
X.500*	**CCITT**

**Emerging standard*

SOURCE: DATAPRO RESEARCH

DESCRIPTION
Voice-messaging standard developed by a consortium of users and vendors. Specifications have been completed but not yet voted on.
Popular name for DIS 9596. A network management protocol, not yet finalized.
The same as ROSE. Defines functions involving shared remote applications. Not yet finalized.
The same as CMIP.
Popular name for ISO 9735. Addresses EDI in the global market. (Compare with X12.)
Applies to high-speed fiber-optic LANs (100 Mbps). Four variations (three of which are finished) apply to different aspects of fiber-based communications and control.
Popular name for ISO 8571. Used for file transfer among OSI systems.
Principally LAN standards (except for IEEE 802.6, which is used for WANs).
Project underway to define operating parameters and interfaces for a network that will accommodate a variety of mixed digital transmission services.
OSI basic reference model.
Same as FTAM. File transfer among OSI systems.
Same as EDIFACT. Addresses EDI in the global market.
Popular name for DIS 9072. Defines functions involving shared remote applications. Not yet finalized.
North American carrier standard that works within the digital hierarchy to connect widely distanced LANs at native LAN speeds.
Specifies modem transmission at 9,600 bps. Includes error-checking.
Addresses EDI in the domestic market. (Compare with EDIFACT.)
Defines the interface between data termination equipment and data communications equipment for terminals connected to packet-switched data networks.
Defines formats for globally compatible electronic mail and other message-oriented information exchange.
Defines global electronic directory, somewhat like the telephone company's white pages. Coding will be hierarchical, with different codes for specific countries, organizations, equipment and applications.

The Awful Truth

Five reasons supposedly compatible systems often aren't

. . . .

1. Products that claim to adhere to the same standards aren't necessarily compatible. Standards, particularly those developed by international standards bodies, are merely guidelines. They typically provide a menu of options that vendors may choose from. Even standards developers admit that most contain gaps and ambiguities. This means that it is up to implementation groups to select from the "menu," fill in the gaps, and make decisions to erase ambiguity. Depending on the choices made, two different implementation groups may create two different variations that are not totally compatible—even though they're based on the same model.

2. Products based on emerging standards aren't necessarily compatible. Emerging standards are standards that have not yet been finalized—or haven't really caught on. They have even more gaps and ambiguities than existing standards. Standards that have stood the test of time are the best bets. If you choose to invest in a product that supports an emerging or new standard, find out whose implementation of the standard it uses and how many other vendors use that implementation.

3. The system may be incompatible and/or unreliable at the LAN level. Statistically, a company is likely to face most of its internetworking problems with its LAN-to-LAN connections (keeping the LAN segments and LAN-to-LAN connections up and running, locating the causes of network failures, sharing applications on the LAN or among LAN segments). So-called compatible equipment may be unable to properly handle the traffic load between LAN segments. And the more complicated a company's LAN architecture, the more prone it is to failure. Minor changes in configuration (adding a terminal, installing revised software) may cause major problems, preventing users from sharing applications and information on an ongoing basis.

4. Using one LAN protocol does not ensure that data can be exchanged throughout a LAN. The effectiveness of LAN protocols is limited by distance. For example, Standard Ethernet LANs can only operate on LANs no longer than 500 meters. Thus equipment such as bridges are necessary to link many sub-LANs on a campus or industrial park, or even on different floors of a high-rise building.

5. Applications, not just networks, need to be compatible. In client/server networks, there are at least four methods of linking applications.

- ▶ **Application program interfaces** (APIs—for instance, "Sockets" for the Berkeley Unix operating system; "SPX" for Novell Netware) are well-established but not easily portable among different operating environments.
- ▶ **Database servers** (vendors include Ashton-Tate, Microsoft, IBM and Oracle), can support applications across different operating systems but are limited to applications where programs share only raw data.
- ▶ **Remote window systems** (the X Window System for Unix; NeWs for Sun and AT&T) allow users to see two or more applications on a screen but not to merge them into a common application.
- ▶ **Remote procedure calls** (RPCs) are a promising new technology based on CASE programming tools, but as with APIs, no single standard exists for would-be users.

SOURCE: JILL A. HUNTINGTON-LEE,
DATAPRO RESEARCH

Glossary

Asynchronous Transmission: Each information character, or sometimes each word or small block, is individually synchronized, usually by the use of start and stop elements.

Bandwidth: The range of frequencies, expressed in hertz (Hz), that can pass over a given transmission channel. The bandwidth determines the rate at which information can be transmitted through the circuit—the greater the bandwidth, the more information that can be sent in a given amount of time.

Bridge: A relatively simple and inexpensive device that passes data from one LAN segment to another without examining or altering the data. The bridged LAN segments must use the same protocol. Well-suited for centralized networks with a few high-bandwidth links.

Brouter: A bridge with minimal routing capabilities (see bridge, router). In general, a brouter can deliver least-cost routing; some can also deliver minimal load balancing.

Bus: Local network topology, such as used in Ethernet and the token bus, where all network nodes listen to all transmissions, selecting certain ones based on address identification.

Client/Server Model: In most cases, the "client" is a desktop computing device or program "served" by another networked computing device. Computers are integrated over the network by an application, which provides a single system image. The server can be a minicomputer, workstation or microcomputer with attached storage devices. A client can be served by multiple servers.

Fiber Optics: A technology that uses light as a digital information carrier. Glass-based fiber-optic cables occupy far less physical volume than conventional coaxial cables and wire pairs for an equivalent transmission capacity. The fibers are immune to electrical interference.

Gateway: A protocol converter that restructures packets of information so they can pass between networks using different standards.

Integrated Services Digital Network (ISDN): Project underway for standardization of operating parameters and interfaces for a network that will accommodate a variety of mixed digital transmission services.

Interface: The physical connection between two communications devices, comparable to an electrical plug and socket connection with "male" and "female" components.

Internet(work): Several LANs linked together. A local internet is confined within a single building; a campus internet includes two or more nearby buildings.

ISDN: See Integrated Services Digital Network.

LAN Segment: A LAN linked to another LAN by a bridge. (Bridges enable two LANs to function like a single, large LAN.)

Multiplex: To interleave or simultaneously transmit two or more messages on a single channel.

Multipoint: Pertaining or referring to a communications line to which three or more stations are connected. It implies that the line physically extends from one station to another until all are connected. (Contrast with point-to-point.)

Network Redundancy: A communications pathway that has additional links to connect all nodes in case one link goes down.

Network Topology: Describes the physical and logical relationship of nodes in a network, the schematic arrangement of the links and nodes (see bus, ring, star and tree), or some hybrid combination thereof.

Open Systems Interconnect (OSI): A classification of standards for promoting global connectivity. OSI standards are generally promulgated by the International Standards Organization and used by a variety of standards-setting bodies.

Packet Switching: A data communications technique where a message is broken down into fixed-length units (packets), which are then transmitted to their destination through the fastest route. Although all units in a message may not travel the same pathway, the receiving station ascertains that all units are received and in proper sequence before forwarding the complete message to an addressee.

Point-To-Point: Describes a circuit that connects two points directly, where there are generally no intermediate processing nodes, although there could be switching facilities.

Private Wide-Area Network: An internetwork made up of internetworks and LANs in different cities.

Protocol: A collection of rules, voluntarily agreed upon by vendors and users, to ensure that the equipment transmitting and receiving data understand each other. In general, protocols comprise three major areas: the method in which data is represented or coded (eg., ASCII); the method in which the codes are received (eg., synchronously or asynchronously); and the methods used to establish control, detect failures or errors, and initiate corrective action. Terminals performing the same functions under different protocols cannot be used on the same system without protocol converters or emulators.

Ring: LAN topology in which stations are connected to one another in a closed logical circle, with access to the medium passing sequentially from one station to the next by means of polling from a master station or by passing an access token from one station to another (token ring).

Router: A sophisticated, protocol-specific device that examines data and finds the best route for it between sender and receiver. Selects the cheapest, fastest or least-busy of all available routes. Routers are preferable to bridges for large networks with relatively low bandwidth connections.

Software-Defined Network (SDN): Also known as virtual private networks, SDNs use the carrier's public telephony network to provide the network functions of private lines. Users can design, change and manage a national network without investing in capital equipment or managing switches and leased lines. AT&T, MCI and US Sprint all offer SDNs.

SONET: See Synchronous Optical Network.

Standard: A document that recommends a protocol, interface, type of wiring or some other aspect of a network. It may even recommend something as general as a conceptual framework or model (for instance, a communications architecture). Standards are developed by internationally or nationally recognized standards bodies or vendors. So-called "de facto standards" are widely used vendor-developed protocols or architectures, such as IBM's Systems Network Architecture (SNA).

Star: LAN topology in which each station is connected only to a central station by a point-to-point link and communicates with all other stations through the central station.

Synchronous Optical Network (SONET): A North American carrier standard developed by Bellcore that works within the digital hierarchy. SONET-based products offer public-carrier connection of widely distanced LANs at native LAN speeds and are now available from AT&T, Northern Telecom and others. Offered in basic building blocks of 50 Mbps, SONET services allow users to construct a single bitstream of up to 13 billion bits in bandwidth.

Synchronous Transmission: Timing is achieved by transmitting sync characters prior to data. It does not use such redundant information as the start and stop bits in asynchronous transmission to identify the beginning and end of characters, and is thus faster and more efficient.

T-Carrier Services: High-speed private-line digital transmission services that provide large-volume transmission between two stations. T1, the most common T-carrier service, operates at an aggregate data rate of 1.544 Mbps and consists of 24 separate channels. (T2 and T3 are rated at 6.312 Mbps and 44 Mbps, respectively.) T1 channels are 6 to 30 times more cost-effective on a per-bit basis than voice-grade lines, but users must be able to fill the 1.544 Mbps channel to take full advantage of savings. **Fractional T services**, however, enable businesses to lease a fraction of a T line.

Tree: A type of bus network topology in which the medium branches at certain points along its length to connect stations or clusters of stations. Also called a branching bus.

Very Small Aperture Terminal (VSAT): An earth station with a small antenna, usually 6 meters or less. Used in conjunction with orbiting satellites for point-to-multipoint data networks, they have dramatically lowered the cost of satellite communications.

Virtual Private Network: See Software-Defined Network.

SOURCE: DATAPRO RESEARCH

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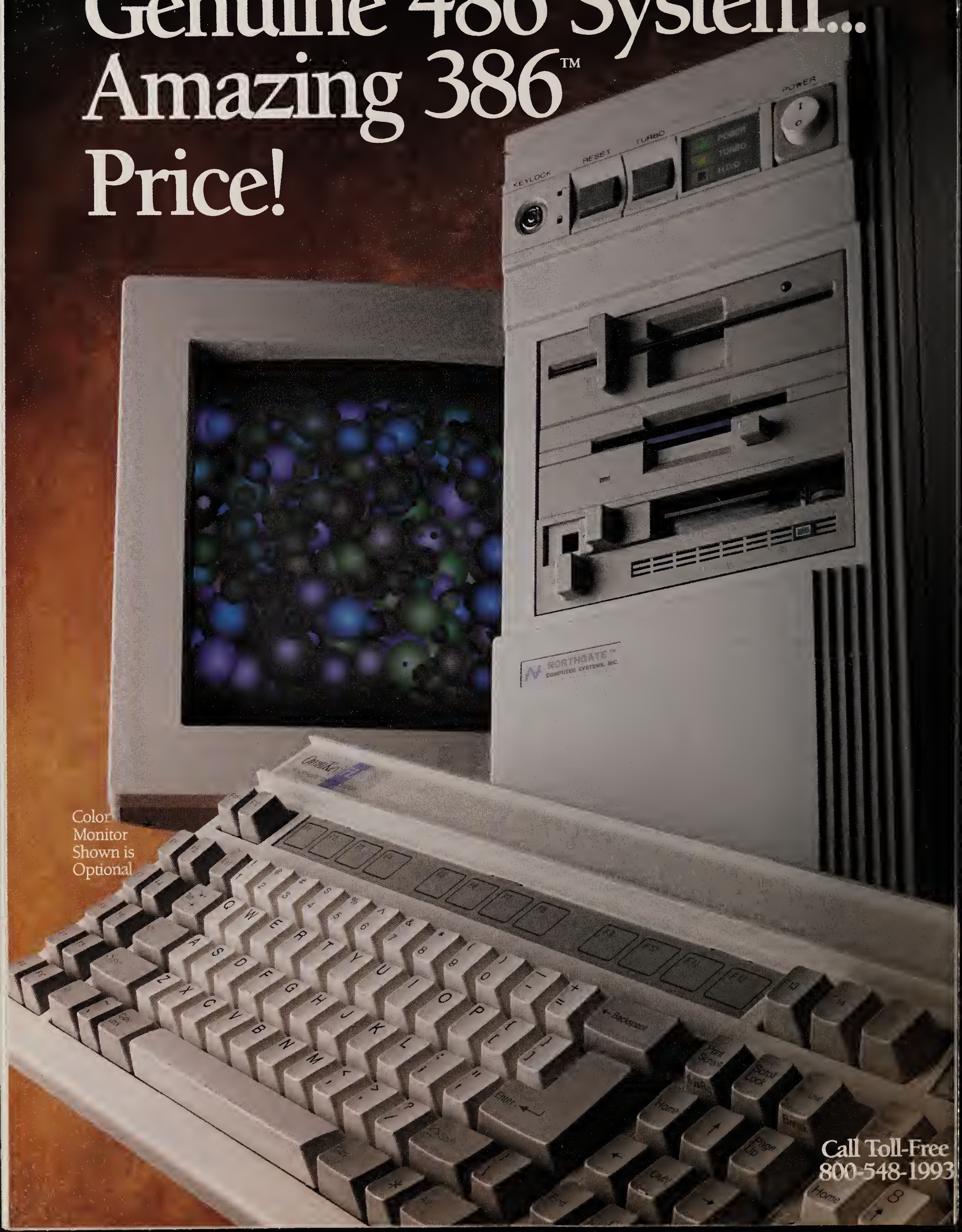

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Transmission Media Guide

TECHNOLOGY	INFORMATION CARRIED	CAPACITY (BANDWIDTH)	TRANSMISSION STRUCTURE	RELATIVE COST	COST OF ENTRY	COST/USE TRENDS	SECURITY
Fiber Optics	voice data video	10 Mbps to 2.4 Gbps	primarily point-to-point	high cost for small installations	moderate to high	usage up, cost down	excellent
Satellite	voice data video	multi-T1	point-to-point, multipoint, broadcast	about 60% of terrestrial	low as carrier service, moderate to high for private	both up somewhat	requires encryption
Microwave	voice data video	1.544 Mbps to 45 Mbps	point-to-point, some multipoint	high for single channel	low to moderate	usage up, cost stable	low; good with encryption
Infrared	data	45 Mbps or less	point-to-point	less economy of scale than microwave	low	usage up, cost down	good
FM and TV Sub-Carrier*	voice data	low speed	broadcast	not applicable	high	unpredictable	requires encryption

**FM and TV sub-carriers require a special interface*

SOURCE: DATAPRO RESEARCH

Choice of Weapons

TECHNOLOGY	TECHNOLOGY SOURCES	DIAL-LINE SUBSTITUTE	LEASE-LINE SUBSTITUTE	MULTIPOINT COMMUNICATIONS	ONLINE DATA APPLICATIONS	VIDEO APPLICATIONS	HOST-TO-HOST LINKS	PBX TRUNKING	POTENTIAL PROBLEMS
Fiber Optics	carrier & metro	through carrier	yes	high cost	probably too much capacity	excellent	excellent	excellent	capacity may exceed need
Satellite	long-distance carrier	through carrier	yes	excellent	good if delay is tolerable	excellent	good if delay is tolerable	excellent	delay; space slots limited
Microwave	metro as DTS*	no	yes	yes	through remote concentrator	very good	excellent	excellent	interference and obstructions; FCC license required and frequency space limited
Infrared	some metro	no	yes	no	through remote concentrator	very good	excellent	excellent	short range; poor line of sight may obstruct
FM and TV Sub-Carrier	local FM station	no	no	one-way, excellent	no back channel	no	no	no	very limited availability; low data rate; one-way only

**digital termination system*

SOURCE: DATAPRO RESEARCH

Sorcerers' Apprenticeships

Colleges & Universities with Programs in Telecommunications

Barry University
Miami Shores, Fla.

Carnegie-Mellon University
Pittsburgh

Christian Brothers College
Memphis, Tenn.

City University
Bellevue, Wash.

Colorado, University of
Boulder, Colo.

Columbia University
New York

De Paul University
Chicago

George Washington University
Washington

Georgia Institute of Technology
Atlanta

Golden Gate University
San Francisco

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Cambridge, Mass.

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Honolulu

Houston, University of
Houston

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Bloomington, Ind.

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Ames, Iowa

Kansas, University of
Lawrence, Kan.

Marylhurst College
Marylhurst, Ore.

Massachusetts Institute of Technology
Cambridge, Mass.

Michigan State University
East Lansing, Mich.

Missouri at Kansas City, University of
Kansas City, Mo.

National University
San Diego

New Haven, University of
West Haven, Conn.

New York University
New York

North Carolina State University
Raleigh, N.C.

Northeastern Illinois University
Chicago

Pennsylvania, University of
Philadelphia

Pittsburgh, University of
Pittsburgh

Polytechnic University
Brooklyn, N.Y.

Saint Louis Community College at Florissant Valley
St. Louis

Saint Mary's College
Winona, Minn.

Southern California, University of
Los Angeles

Southern Methodist University
Dallas

Southern Mississippi, University of
Long Beach, Miss.

Syracuse University
Syracuse, N.Y.

Texas at Austin, University of
Austin, Texas

West Virginia University
Morgantown, W.V.

Wisconsin at Madison, University of
Madison, Wis.

**All schools offer graduate studies; some also offer 4-year undergraduate programs, certificate courses or doctorate programs.*

SOURCE: DATAPRO RESEARCH

Service Plus

Value-added network providers offer more than just a good connection

Value-added networks (VANs) are public data-communications networks that provide basic transmission facilities (generally leased by the VAN vendor from a common carrier) plus additional "enhanced" services, such as computerized switching, temporary data storage, protocol conversion, error detection and correction, and electronic mail. They provide an economical and viable data communications alternative to conventional leased lines. All VANs listed below (except IBM) support the X.25 protocol; most support others as well.

Value-Added Networks

VENDOR & LOCATION	NAME OF SERVICE	NETWORK TYPE	VALUE-ADDED FEATURES
AT&T Basking Ridge, N.J.	**ACCUNET**	data terrestrial	E-mail, error correction, transaction services
CNCP Telecommunications Toronto	**Infoswitch**	data	E-mail, dial backup
CompuServe Columbus, Ohio	**CompuServe Network Services**	data terrestrial satellite	E-mail, dial backup, error correction, databases, EDI, protocol conversion, dynamic adaptive routing
Infonet El Segundo, Calif.	**INFONET**	data terrestrial	E-mail, dial backup, error correction, PC support
GE Information Services Rockville, Md.	**MARK*NET**	data terrestrial satellite	E-mail, dial backup/security, facsimile, databases, protocol conversion, network management, EDI
IBM Tampa, Fla.	**IBM Information Network**	data terrestrial	E-mail, EDI, satellite, application programs, databases, remote computing services
US Sprint Reston, Va.	**Sprintnet*** (formerly Telenet)	data terrestrial	E-mail, dial backup, error correction, PC support, databases, facsimile
BT Tymnet San Jose, Calif.	**TYMNET***	data terrestrial	E-mail, error correction, PC support, databases, EDI, card authorization

**Sprintnet and TYMNET together make up 80 percent of the market.*

SOURCE: DATAPRO RESEARCH

Even though your private network is already using electronic mail and your different office systems are already connected, you'll never be able to extend your communications reach to the rest of the world without a universal messaging network.

Imagine if someone were able to communicate with your SNA, Bisync or OSI network; exchange messages with PROFS, DISOSS and SNADS; emulate a variety of environments through gateways; and provide access to X.25 packet-switching facilities and X.400 messaging so every system could reach every network.

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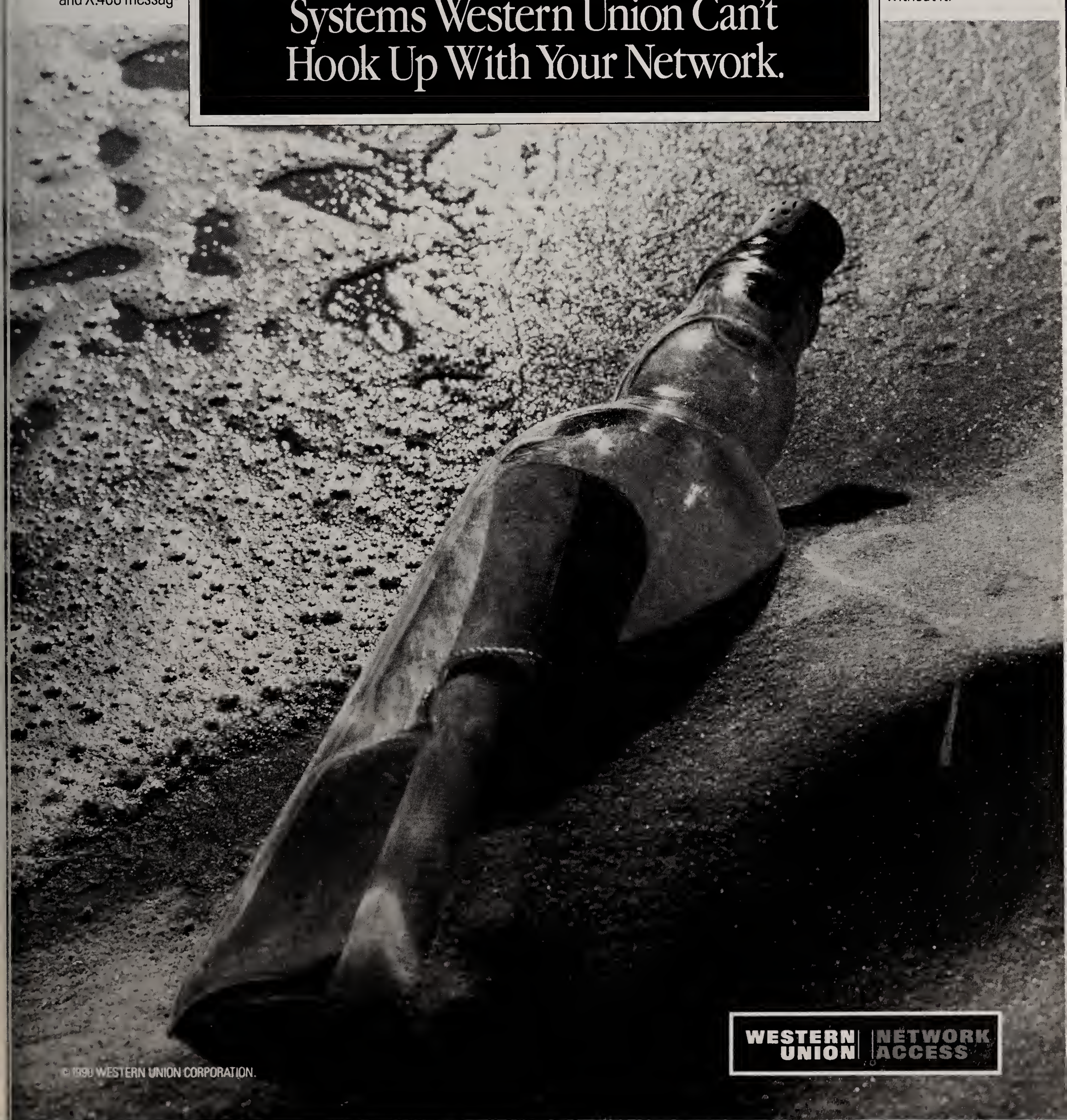

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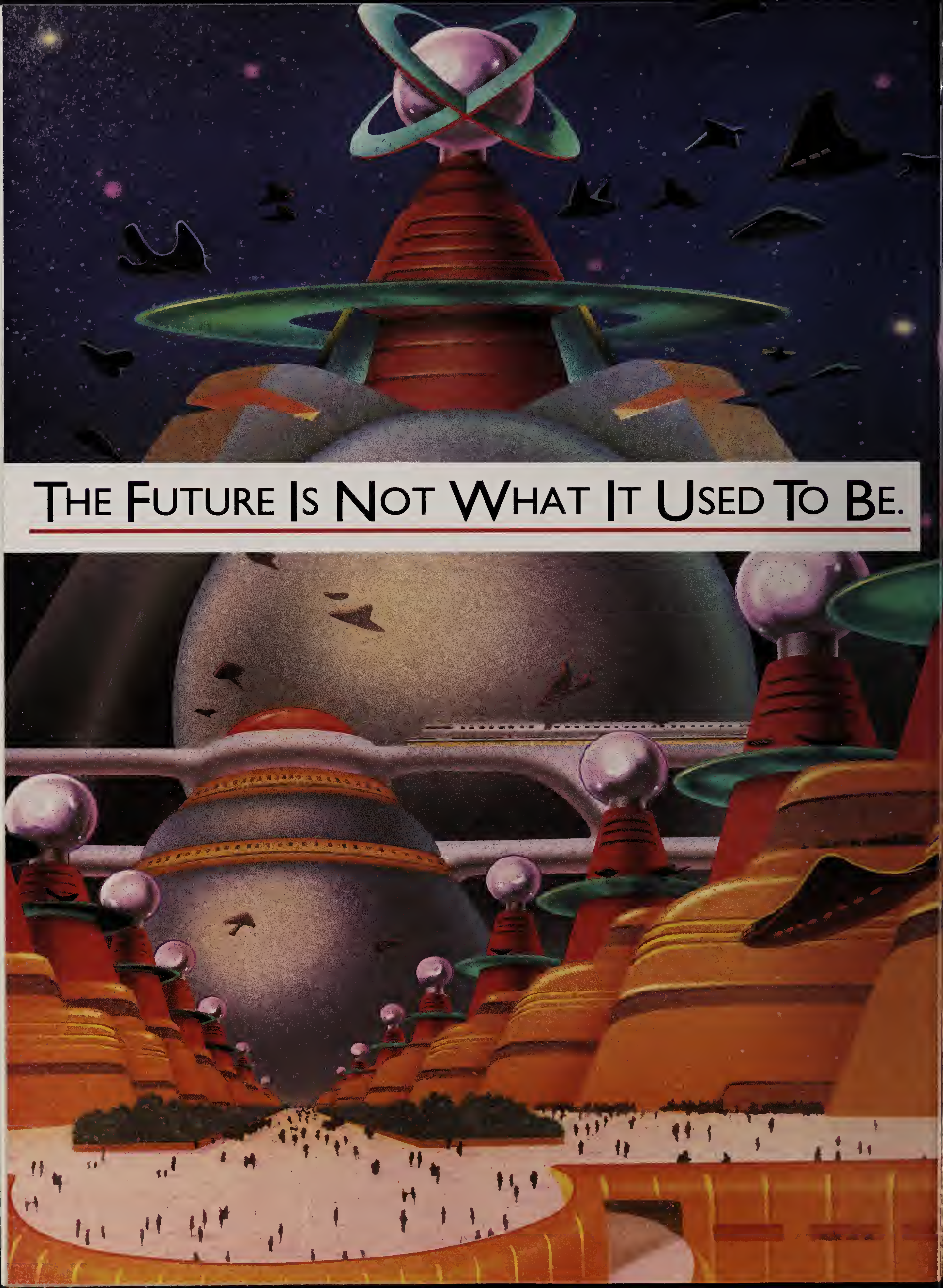
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Members Only

As shared industry networks grow in influence, deciding which groups to join becomes an important competitive question

BY WILLIAM H. DAVIDSON

Over the next decade, the precision, efficiency and velocity of business transactions between companies tied together by electronic networks will greatly surpass the performance of traditional business transactions and relationships. These electronic networks will drive a series of powerful benefits to participants. Let's look at an example.

The American apparel industry operates under severe pressure from foreign manufacturers. Apparel-making is labor-intensive, and labor costs in Latin America, China and other Asian countries are a small fraction of U.S. rates. Yet the industry's future today appears bright.

The emergence of sophisticated new networks are central to the industry's prospects. These networks offer a series of advantages, the most important of which may be a shortening of lead times. The typical delivery cycle for imported garments now exceeds one year. With long lead times, it's very difficult for retailers to accurately forecast future demand for specific items. As a result, retailers suffer significant losses from stock-outs of popular items and mark-downs of slow-moving goods.

The American Textile Manufacturers Industry Association is now deploying a nationwide network that will link fiber and fabric manufacturers as well as apparel makers to selected retailers. Retailers will be able to electronically order specific garments over terminals located in their facilities. These orders will trigger simultaneous requests up the chain for the exact fabrics needed to manufacture specific garments. This electronic order-entry network, combined with new manufacturing and logistics technologies, will allow dramatic reductions in response times. The average industry response time will fall to about eleven weeks, giving retailers a much better basis for selecting garments that will meet actual market conditions. In trials of the new system, total inventory held in the supply channel fell by over 60 percent, order-processing costs fell by 60 percent, and retailer profits rose by 100 percent or more as stock-outs and mark-downs were virtually eliminated. If you were an apparel retailer, would you rather do business in the traditional way or participate in this new shared network?

Shifting operations to shared networks allows dramatic reductions in response times, lowers inventory levels, increases the customer's ability to order to precise specifications, and dramatically reduces operating overheads, functions and costs. These benefits provide the momentum and incentive for the growth of shared networks. Electronic transactions and relationships are appearing in all businesses, but the form and control of shared networks are up for grabs.

The apparel example represents

ILLUSTRATION BY TIM GRAJEK

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essentially an open network. A large number of retailers, apparel makers and fabric and fiber manufacturers will be able to do business over this system. This form of alignment is very loose. It is a cooperative, open venture. In other industries, an individual firm may come to define and dominate the primary electronic network. An outside firm could form and control the electronic channel.

Another important phenomenon is the emergence of "electronic *keiretsu*" groups. In its original form, the *keiretsu* group as it evolved in Japan contains hundreds of manufacturing organizations, distribution groups and other affiliates that orbit around core financial and industrial institutions. These groups are tied together by equity and debt relationships and buying and selling transactions. The electronic *keiretsu* will link all of these hundreds of diverse affiliates together through a shared electronic network.

Mitsubishi, the largest Japanese industrial group, is today deploying a multi-billion dollar *keiretsu* network that will link together all of the thousands of affiliates with business links to the Mitsubishi group.

In the United States, the leading example of this type of structure is General Motors. GM invests about $4 billion per year in building and maintaining its massive information network. This network will link both GM's dealers and its suppliers to the company's automotive operations. It will also serve as the backbone for GM Acceptance Corp.'s financial services network. Through this network, GMAC will today arrange to have customers' monthly car payments deducted directly from their paychecks.

GM's network will permit customers to design their own unique automobile configurations on terminals in dealer showrooms. These customer-designed vehicles will be ordered electronically, and orders will trigger immediate requests for the exact parts and components needed to manufacture the custom vehicle. Rapid inventory response times coupled with short production schedules will allow GM to ship customized vehicles with minimal delivery delays. One of the principal results of this new approach will be a dramatic reduction in inventory and overhead.

> *Customers will be able to design their own unique car configurations on terminals in dealer showrooms.*

The shift to network-based operations holds critical implications for GM suppliers as well. To do business with GM will require a specific commitment to the GM information architecture. That means dealers, vendors and other associates must have the appropriate hardware, software, communications protocols, data formats and other elements of infrastructure. Not all suppliers will make the cut. As a result, GM will have far more intimate links to a smaller number of affiliated enterprises. Traditional business transactions and relationships will be displaced by new high-powered electronic relationships. Both parties will benefit from the new electronic relationship, further strengthening the emergence of a shared network enterprise group.

Many executives are reluctant or unwilling to develop electronic linkages with other parties if it means granting access to databases, information systems and other potentially sensitive information resources. Practically, however, this issue seems to be more of a cultural crutch than a true show-stopper. Security issues can be managed with a combination of authorization and verification procedures, parallel systems, and information processing hierarchies.

One sophisticated approach to managing electronic integration has been developed by Florida Power & Light Co. in Miami. Florida Power & Light classifies its business relationships into five categories, each involving a deeper level of access to information. The first category contains company-qualified suppliers and customers. The second includes customers and suppliers that have electronic interfaces to Florida Power & Light. The third category includes firms with whom the company is conducting EDI transactions. The fourth involves firms with which the company shares some mutual access to information resources. And the fifth involves organizations with which it has truly intimate ties, with virtually open access to each other's information resources (this last represents in effect a co-processing environment).

Business partners can be brought along through these stages as benchmarks are hit. If, as predicted, significant benefits follow from increasing integration, the incentives for moving forward should be inherent in every business dealing. Some partners may stay at a lower level, but the growth of most enterprises will occur in relationships that are linked together electronically in the future.

Electronic networks will account for a growing share of transactions in all businesses. By the end of the decade, firms linked by new networks will occupy dominant positions in most businesses. These firms will enjoy and offer to their trading partners greater efficiency, velocity, precision and customer service. But that doesn't mean we should all invest blindly in information systems.

A company's networking plan constitutes a critical element of its business strategy. But many different network forms will contend for the mainstream in most businesses. CIOs and senior management must position their firms to define or participate in the dominant network in their industries. That means linking internal infrastructure and architecture planning to careful analysis of emerging network trends. Of all the challenges facing the CIO of today, network planning claims first priority.

William H. Davidson is a founder of Management Education Services Associates in Redondo Beach, Calif., and an associate professor at the University of Southern California.

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CIO Magazine *and AMR International*
508 872-8200

This conference highlights networking and connectivity issues for the '90s. Topics discussed include communications strategies and global competition, directions for software in the '90s, top business priorities of IS executives, and managing people and technology. Registration fees: $1,095 to $1,295.

The Emerging Role of Macintosh in the IS Organization

The Fairmont, San Francisco
May 20-23
Managing Apple Computers in Information Systems
312 644-6610

Bill Gates is the keynote speaker at this conference, which is designed for organizations having 100 or more Macintosh computers. Topics include CASE tools, Macintosh development, security, and cooperative processing. Representatives from Apple discuss new products and services. Registration fees: $640 for members; $890 for nonmembers.

Retail Systems '90

Infomart, Dallas
May 22-24
Retail Systems Alert
617 527-4626

The subject of this conference is the introduction of decision systems, networks, distributed systems, and store systems into a variety of retail companies. There are also hands-on workshops, end-user seminars, and an exhibit of vendors specializing in strategic technology. Registration fees: $445 for subscribers; $495 for nonsubscribers; $195 for technical workshops.

Executive Uniforum Symposium

Four Seasons Biltmore, Santa Barbara, Calif.
May 22-24
Seybold Office Computing Group
617 742-5200

The theme of this conference is the UNIX software and applications development environment. The views of industry vendors in hardware, software and networking are presented. There is also a forum to explore the next generation of UNIX applications. Registration fees: $895 for members; $1,095 for nonmembers.

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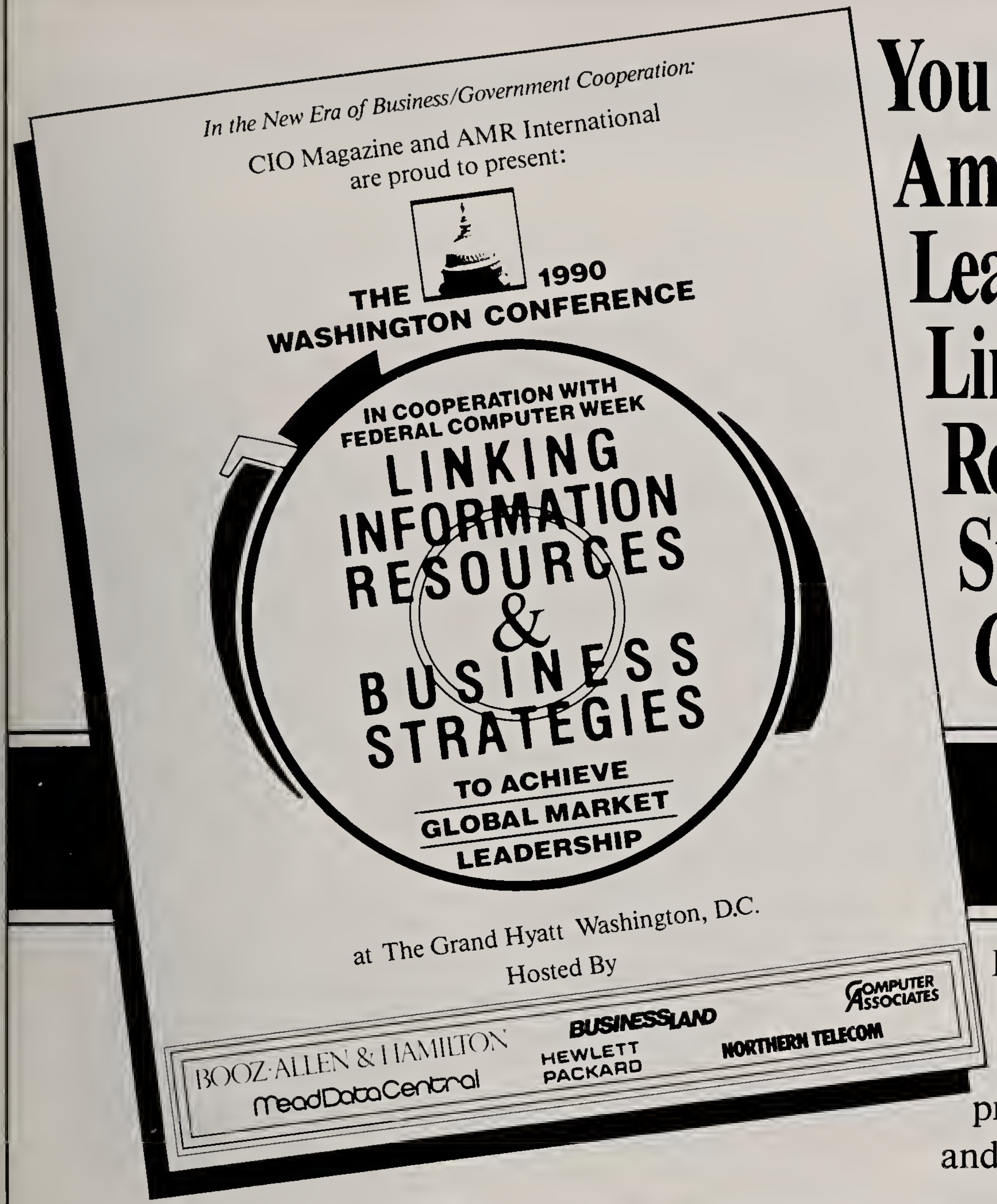

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CONFERENCE CALL

QUESTION: *The boss tells you the IS budget needs to be cut. Where do you begin?*

Today's corporations often rely on IS as much for revenues as for administration. Given current economic realities, however, even the most pivotal IS operations may be required to tighten their belts. With operating units taking a "not in my department" attitude, where is an IS executive to begin?

James L. Kendrick

Program director of Aeronautical Industries Engineering for Aeronautical Radio Inc. in Baltimore (a not-for-profit telecommunications service provider jointly owned by the U.S. airlines)

“I think it's easy for people to look at MIS as purely overhead. It's always too expensive. It's always more than you ever want to spend. So the question I would ask is, which parts of the organization are you really supporting the most?

"You may find that a reduction in a service directly impacts the bottom line of the company's revenue-producing points. The impact of a cut can be magnified when it is translated to the overall business of a company. Let's say I cut $100,000 out of my budget. It may have a half a million dollar impact in terms of providing revenue. You have to start looking at what makes your company tick.

"If you're looking long-term, then you've got to do the typical evaluations of personnel. You need to take a good, close look at using off-the-shelf packages. You've got to curb modification of operating systems. A lot of companies modify an OS because they've got some unique requirements. Then, as the upgrades come, you have to keep changing them. . . .

"Can you place a value on the services you provide? You really have to take a look at whether you've built process for process's sake.”

Michael L. Corrigan

Assistant commissioner for telecommunications services at the General Services Administration in Washington

“I'm running the government's internal telecom system, so my budget's going up. If someone came in and asked me to cut my budget, I'm not sure I'd tell them I would. We are in the position of doing governmentwide telecommunications less expensively than the agencies can do it themselves. We're moving agents from dedicated long-distance lines to the new FTS [Federal Telecommunications System] 2000.

"I get all my money back from the agencies. So I don't have a budget in the sense of funds being appropriated. We charge our overhead costs back to the agencies as well.

"The amount of management services we provide to the agencies is based on the amount we anticipate they're going to order. I expect the orders for FTS 2000 to go up by 50 percent a year. In any organization when you have that kind of growth and somebody tells you to cut your management service growth, you'd probably look at them like they're crazy . . . We're extremely conscious that we have to give them excellent service. Essentially, all our staff is in customer service and contract administration. We can't give our customers first-rate service if we cut our customer-service staff.

"The only thing that would cause us to change our budget would be a change in our direction. If someone came in and said, 'We were just kidding; you're not supposed to provide all the dedicated long-distance service to the federal government,' then I can see that we would.”

Patrick L. Murray

Vice president of MIS for United Stationers Supply Co. in Des Plaines, Ill.

“I think my question would be, 'Which of these services doesn't the business require any longer?' Having developed a budget each year based on re-evaluating our services, we know pretty precisely what we're spending our money for.

"It's not the IS executive's responsibility to determine who we provide service for. We're a service function to our business. And it's those folks who count on our business who really have to make the final decision.

"I would tell each department which parts I think are fundamental to the survival of our current activities and which parts are discretionary.

"Part of our budget process is development of a contingency plan—a plan that says, if our company came back and said take out 10 percent, what could we take out? The way we put things into the budget in the first place is based on return on investment. We have all the data to make those decisions, but fortunately we've never had to do it.”

ILLUSTRATION BY KEN CONDON

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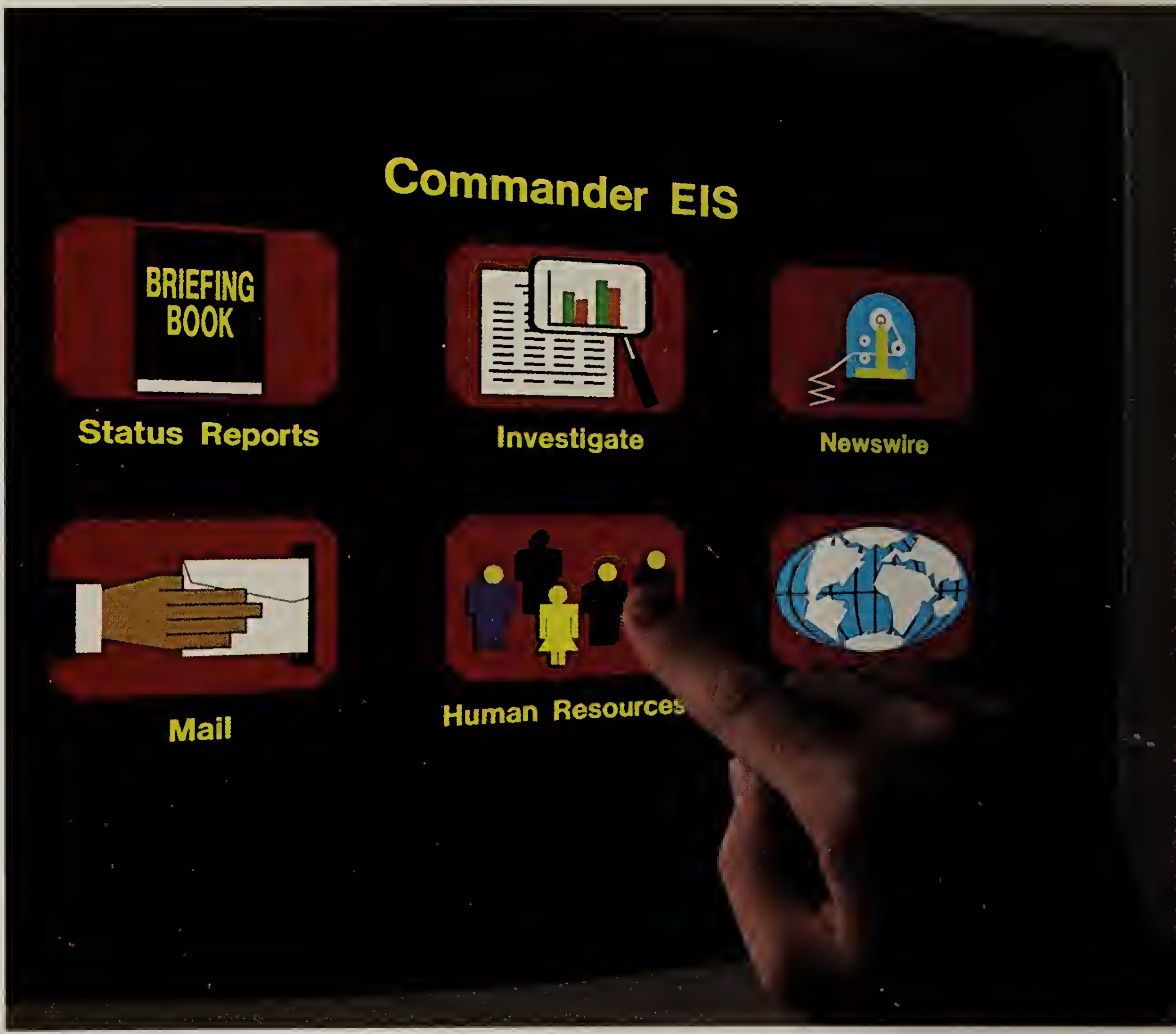

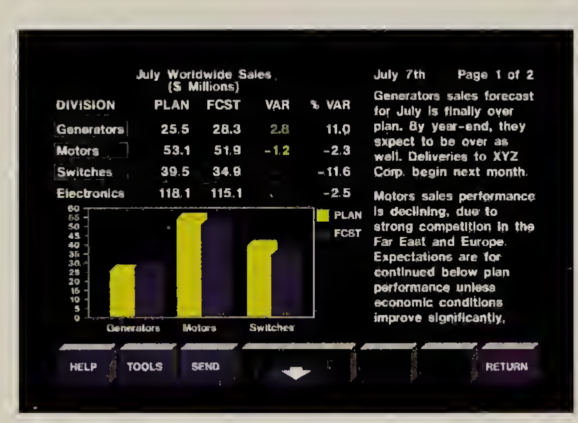

July Worldwide Sales
($ Millions)

DIVISION	PLAN	FCST	VAR	% VAR
Generators	25.5	28.3	2.8	11.0
Motors	53.1	51.9	-1.2	-2.3
Switches	39.5	34.9		-11.6
Electronics	118.1	115.1		-2.5

July 7th Page 1 of 2

Generators sales forecast for July is finally over plan. By year-end, they expect to be over as well. Deliveries to XYZ Corp. begin next month.

Motors sales performance is declining, due to strong competition in the Far East and Europe. Expectations are for continued below plan performance unless economic conditions improve significantly.

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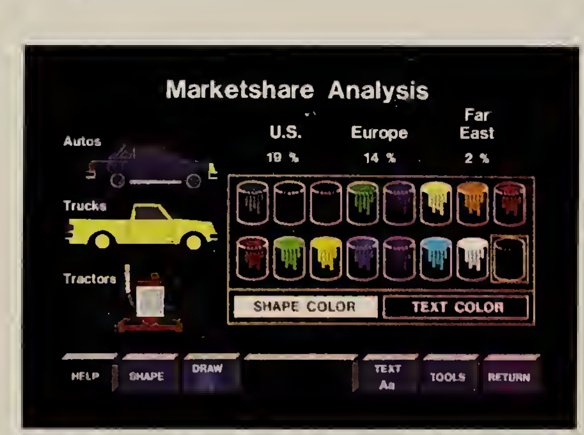

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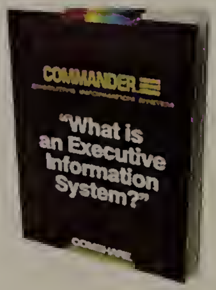

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